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Engineering News-Record

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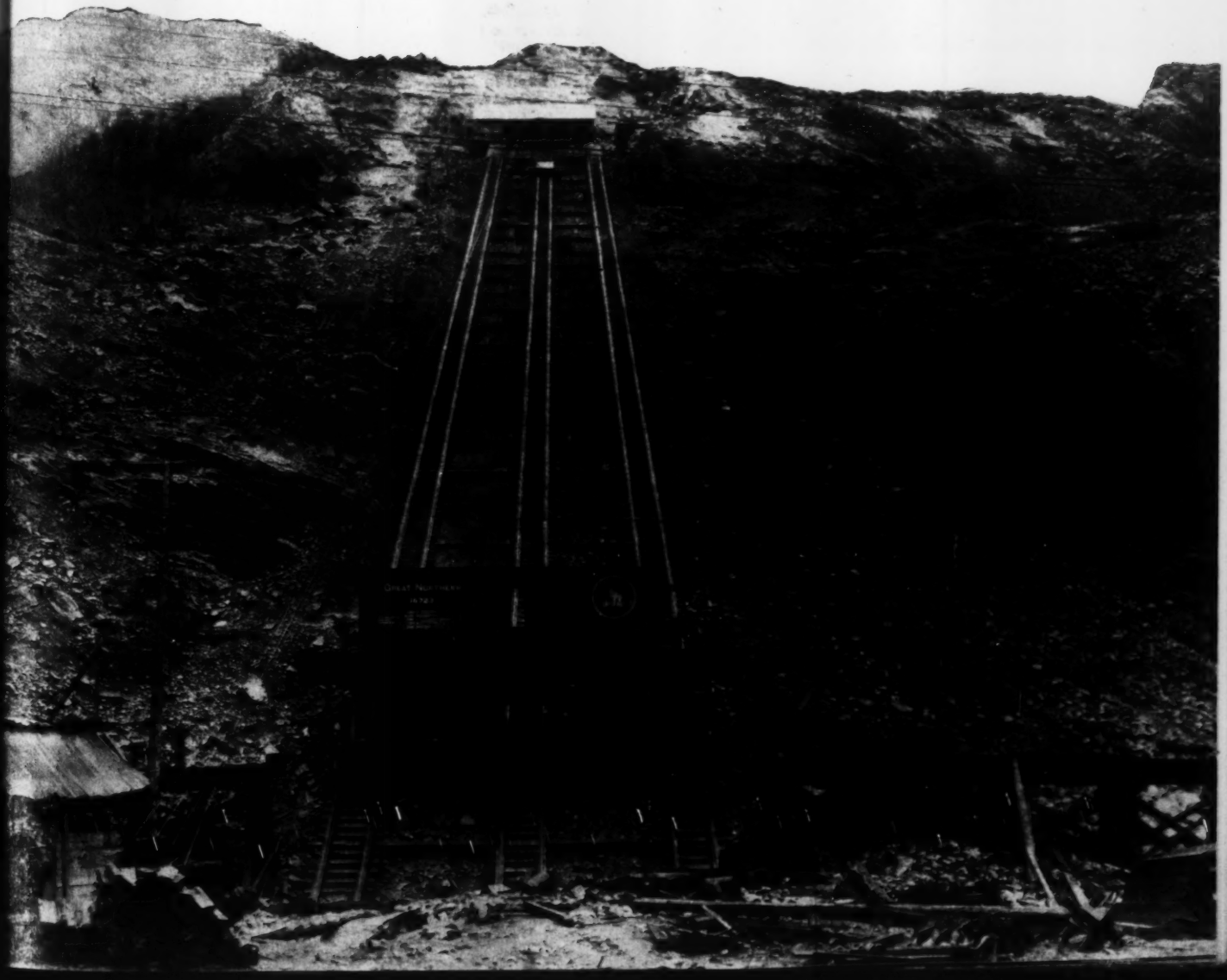
July 19, 1928

Platform Lift Raises Cars 313 Feet on Construction Railroad for Skagit River Power Developments



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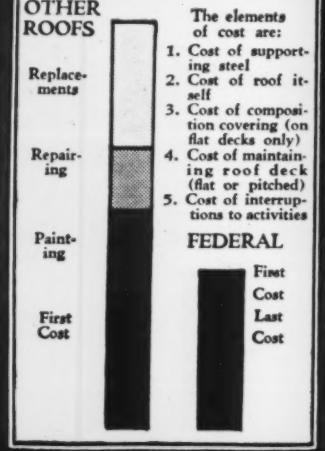

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New York, July 19, 1928

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Volume 101 NEW YORK, JULY 19, 1928 Number 3

A New Angle

WHAT may prove to be a sharp new angle to the elimination of connections between potable municipal water supplies and auxiliary fire protection or industrial supplies is afforded by the announcement of new apparatus and a new policy of the New York State Department of Health, summarized in our news pages last week. The new apparatus is a "fire pump chlorinator," coming into use automatically as soon as the pump starts and injecting chlorine into the secondary supply at a predetermined rate that keeps pace with the volume of polluted or suspected water being pumped. The new policy is to permit the continued use of cross-connections provided the special chlorinator is installed. Such rigid conditions for this continuation are laid down that possibly some owners of industrial plants may prefer to eliminate cross-connections and have done with them and their problems rather than go to the first and operating costs and all the accompanying close supervision on their own part and that of public authorities which the new plan entails. The attitude towards the plan taken by both the industrial plant owners and the factory mutual insurance companies will be awaited with interest, as will also that of state sanitary engineers outside of New York and water-works officials in that and other states who have taken a firm stand against cross-connections under any and all conditions.

To Improve a Bad Record

ACCIDENTS within the construction industries have been mounting steadily until they now comprise more than one-fourth of the total of industrial accidents. The press of the Nation is beginning to comment on the situation. As everyone knows, many of these accidents are inexcusable; most or all are preventable. A conference on proposed safety rules for construction industries met at New York recently, at the call of the American Engineering Standards Committee—a timely movement. Representatives were present from labor boards, insurance companies, contractors, architects and public offices. Judging from the prevailing attitude of these men, action will go forward and will lead to the preparation of a set of national safety regulations. There were only one or two dissenting voices; some contended that educational methods, such as are being carried on by the Associated General Contractors, are more effective and desirable. However, the situation has become intolerable. Education and regulation both are needed to bring about reform quickly enough to stave off drastic outside action. True, as pointed out in the conference, any proposed regulations might be subject to incorporation as laws by legislative action, an event which to some seems undesirable. But many states have already passed laws regulating construction work in an attempt to prevent accidents, and many more states are sure to follow. Why not originate a sane national code for the guidance of such legislative action? Many contractors, through their own efforts and through associations, are waging safety campaigns, incidentally reaping benefits in lower insurance rates. But concerted action must be taken by all within the industry. Construction accidents must be reduced. The A.E.S.C. conference was a step in the right direction.

Restudy of the Colorado

MEN of recognized ability, judgment and fairness have been selected to constitute the board which is to study the Boulder Dam project as directed by Congress. Their findings should be effective in answering a number of questions raised concerning the feasibility and engineering merit of the proposed plan of regulating the flow of the Colorado. By intent the board includes no men of the Far West. In this bitterly contentious issue everyone in the states of the river basin is already committed to one or another of the opposing views, and if a new, independent judgment was to be obtained it was a prime requirement that the members of the board should be without local bias or other interest. Besides meeting this requirement the selections are satisfying with respect to competence and breadth of understanding, for the two geologists are men of special insight into matters of the structure of rock strata, while the engineers are eminently fitted to speak with authority on the technical feasibility of building dams and dealing with river flows. Jointly they can accomplish the necessary purpose of removing from the Colorado problem the shadow of doubt thrown around it by the St. Francis dam failure. At the same time they can do a most valuable service in defining the relations of flood control, water conservation and utilization of the great natural—and national—resource which the river constitutes.

Old and New

THAT great drama of the polar wastes which reached its present end in the rescue of Nobile's airship crew of explorers by the Russian icebreaker "Krassin" displays to a wondering world a striking victory of strength and endurance in competition with skill—a ponderous steamship outdoing those highly refined tools of modern art, the airship and the plane. The vessels of the air either failed in their struggle against the perils of the North, or at best achieved only fragmentary results. They had thought to overmatch the ship in polar exploration, but when the obstacles presented by great masses of floating ice had to be overcome only the great power concentrated in the steamship was able to succeed. The older tools retain an advantage, it seems, even though modern invention may try to crowd them into the background. Yet even in the ice-breaker's sensational rescue voyage the genius of modernity was decisive, for without the help of radio to guide and of the airplane to reconnoiter, the smashing attack of the powerful vessel could have had only slender hope. It was the old and the new in co-operation that brought the lost men back to the world. The dramatic feat parallels the commonplace

experiences of every day, for in technical achievement new and old products of human ingenuity are always joined together. The new increases mankind's resource by adding to the old; rarely or never does it displace it.

Abroad and at Home

THERE are striking similarities as well as differences in sewage treatment in England, Germany and the United States. Many of them are brought out in this issue by an American engineer who recently visited twenty-five typical sewage-works in Great Britain and Germany. The outstanding similarity is that in all three countries sludge disposal is still so great a problem that it may almost be called unsolved. To the uninitiated this will seem strange; all the more so when they are told that the entire solid contents of sewage is only a fraction of one per cent of the whole mass dealt with. From the beginning of sewage treatment it has been relatively easy to separate the solids from the bulk of the sewage; that is, produce a well clarified effluent, but when the latter is drawn off the solids remaining are suspended in a relatively large volume of water, the moisture content being surprisingly close to 100 per cent, and liquids and solids clinging together more tenaciously. In the activated-sludge process, the growing hope of the last dozen years, clarification is high, but the sludge presents difficulties of handling, particularly when atempts are made to get the moisture down to 10 per cent so that the sludge may be used as a fertilizer base. Sludge handling is only one of many interesting features of Mr. Gascoigne's article, however. Using a topical rather than a locality method of treatment, the author gives an admirably clear picture of many current phases of European sewage treatment, correlated with American practice.

A Conservative Report

REPORTING on the washout of the Greenville, S. C., water-supply dam at Table Rock Cove, the three engineers appointed for the purpose have brought in conservative findings. They may be adequate for the present needs of the local water commission, but they fail to cover the essential points of engineering concern. Important questions on the behavior of earth dams and the strength of deeply-buried pipes are left unanswered. In fact the report gives little more information than was apparent from the account written a few days after the accident. It does not go into causes beyond saying that the reservoir drain pipe broke, which was known almost from the first moment. What if any relation existed between the pipe break and the near-by slump of the downstream slope, or between either of these events and the flow of springs in the valley side and floor, remains to be cleared up. The bearing of the character of the embankment material on the slump also remains a question, the more interesting because the factors which determine soil stability are still very largely unknown. Earth of satisfactory stability for structural use should be expected to hold its position on a reasonable slope even when saturated, as does a natural hillside—or, for that matter, the waterside slope of an earth dam or of a levee or dike. Hence those conditions of soil constitution which disappoint the expectation by permitting a slump such as occurred at Greenville are particularly important matters for engineering study. There are equally important questions relating to the breaking of the pipe, but when the commission examined the dam the pipe was still full of water and its condition could not be seen, and therefore information is lacking on both the nature of the break and the integrity of the rest of the pipe. The case should throw light on the vital matter of the security of an unprotected pipe under a high embankment, but this result awaits a later time. During reconstruction of the dam there should be fuller opportunity to go into these several questions. It is greatly to be hoped that the opportunity will be taken, for the Greenville failure is unique in its possibilities of instruction and should furnish the engineering profession more complete knowledge of dam construction.

Tax Value vs. Rate Value

AN ATTEMPT to tax real estate upon a value based upon the railroad's own valuation of its property has developed an interesting controversy with the Lehigh Valley Railroad Company at Buffalo. The question involved is not new, but a better case embodying it would be hard to find. Final decision of the case may contribute greatly to clearing up present conflicting views on the question.

The railroad owns undeveloped waterfront property upon which, in its valuation proceedings before the Interstate Commerce Commission, it placed a value of $10,000 an acre. This was far in excess of the value which the city had been using in computing taxes. Subsequent to the railroad's declaration of its own value the city increased the assessed valuation to about $6,000. The railroad protested and the matter was taken into the courts, where a referee determined that the fair taxable value was about $2,000. This finding has now been upheld by the State Court of Appeals; its majority decision states, in effect, that the act of placing a high value upon its property in proceedings before the Interstate Commerce Commission does not bind the railroad company to accept a similar high assessment value on the part of a tax board.

It may be that this decision carries the hint that the two values under discussion have the same base; but it would have been helpful had the court expressed itself more specifically as to this. The equities of the case are not fully discussed. The value which the railroad company placed upon its property was for the purpose of computing the amount of income it should be permitted to earn to give it a fair return upon the property which it devotes to transportation purposes. The property in question brings in no return. Even if bought to provide for future expansion it serves no useful purpose as part of the country's railway system, and under the law the company is perhaps entitled to no return on the investment. At all events it seems clear that shippers should not be required to pay the railroad company a return upon an exaggerated value nor, if the high value is a true one, should the taxing authorities be compelled to use a fictitiously low value for assessment.

If the railroad company insists before the I.C.C. upon claiming a return on the high value, it ought in all fairness be willing to pay taxes on a correspondingly high value—so long, at least, as the system of taxing public utilities is retained. To permit the railroad company to profit from the high value of its property while denying the city the right to do likewise is an obvious injustice and an evasion of the accepted principle of having taxation bear equally on all pursuits.

Major Highway Bridges

SOME years ago a new activity in the construction of large highway bridges came into being. It was the outgrowth of the rapid development of highway use by motor vehicles, which early revealed the utter inadequacy of existing facilities for crossing the large rivers of the country. The new demand expressed itself both through pressure on legislative bodies to build public bridges and through demonstrated readiness to pay at least equal tolls to private bridge owners as to ferry operators. Accordingly, for some years there has been extensive building of large bridges; but the demand is still unsatisfied, and the activity continues unabated and may even increase further.

To understand this movement and deal with it constructively requires a due perception of the demand behind it. Thus it is the traffic demand that has caused San Francisco to struggle and grow impatient with its water-binding fetters. The city, now dependent on ferries, wants a speedier and more direct connection with the East Bay region; when business is dull, or when someone asks what is the matter with San Francisco, lack of a transbay bridge is often alleged as the answer. The argument may seem fanciful, but there is doubtless real effect of the city's water separation from its eastern suburbs and outliers.

But the situation is seen most clearly along the Mississippi. The people of Cairo and Vicksburg feel that prosperity is just around the corner, to arrive with the completion of bridges over the Mississippi now under construction. The Cape Girardeau bridge, nearly completed, is looked upon as about to open a business revival. Other bridges are projected across the Mississippi, and they too are looked for to render important service to the people on both banks. Heretofore it has been easy to observe in the river-bank population the effects of isolation, particularly where the river is a state boundary. The rural communities of Arkansas and Mississippi have different ideals; they treat their labor differently and it reacts accordingly. One finds, for example, a stricter adherence to contract on the eastern side. Observation indicates that ferries do not accomplish adequate interconnection of the separated populations. Their infrequent and expensive service is an effective bar. With the help of bridges the riverbank populations will be more thoroughly interpolated.

Hard roads have made their influence felt in very evident manner. They have concentrated as well as increased the traffic at natural focal points. Seven ferries now operate profitably at Cairo, whereas only a single one had a precarious existence before good roads were built. The main highway from Chicago to New Orleans here crosses to the Missouri side by ferry, the first crossing of the river, followed by four others before the Crescent City is reached—a return to the east side by toll bridge at Memphis, a ferry crossing over the Yazoo into Vicksburg, again a ferry out of Vicksburg to the Louisiana side, and a final return by ferry to the east side at Natchez. And on such a journey ferries prove an unwelcome break in the travel along modern well-surfaced roads. The wayfarer takes little pleasure in ferry traverse, particularly where the vessels are but improvised barges and the service intervals are measured in hours. Little wonder that bridges are hailed as symbols of a new era!

Along the Ohio the strength of the demand for bridge crossings made itself felt earlier than on the Mississippi. Half a dozen new bridges have been built in recent years; one or two are now building. A number of them, moreover, were financed by local capital, an indication that the human and commercial need for bringing the two banks closer together was a more important factor than the seeking for toll profits.

When we thus observe the meaning of bridges in relation to the intercommunication needs of our own people, it is not surprising that far to the south, in Panama, the demand for bridge connection has become a critical matter. There the Canal cut apart two areas that depend on ready traffic connection, and the transportation gap has not been closed by bridging or tunneling. Slow, infrequent ferry service is the only tie between the severed regions, and its inadequacy has given rise to some irritation between the officials of Panama and of the Canal Zone. President Chiari is quoted as saying that the principal objection Panama has to ratifying the 1926 treaty is the omission of an agreement to bridge or tunnel the Canal. Eventually, we may be sure, the Canal will be bridged; Panama, cut in half, is clearly entitled to an adequate transport connection between its east and west portions.

With this new growth of bridge construction has come the problem of private toll bridges. This development is due to the limited ability or willingness of public bodies to provide tax or bond money for costly bridges, and the readiness of private interests to finance such work on a toll basis. In the short period since the Bear Mountain bridge over the Hudson was undertaken a remarkable activity of promoters and bond brokers has developed. Ample demonstration has been had of the service which private capital can render, even apart from financial readiness, by providing needed bridges without the delays and negotiations that beset most municipal or state undertakings. At the same time strong opposition has sprung up to the permanent laying of toll barriers across our road system. The public has long since come to understand that public improvements must be amortized in a measurable time if we are to progress, and it therefore sees in the private toll bridge a disturbing and hampering element.

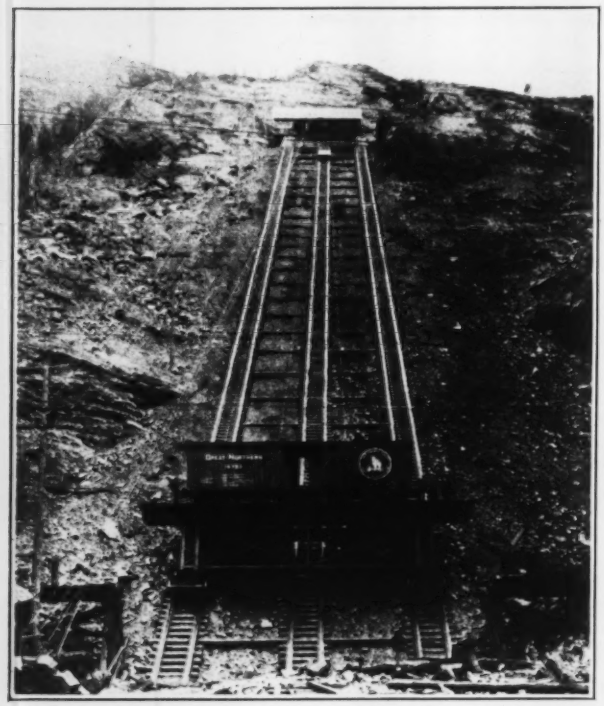
Publicly built toll bridges have developed one answer to this conflict of conditions. The Philadelphia-Camden bridge over the Delaware, the four great bridges of the Port of New York Authority and the semi-public Peace bridge at Buffalo are the prime representatives of the type. Yet it cannot be claimed that they overcome the inherent shortcomings of public construction, for the slow progress of the Mid-Hudson bridge at Poughkeepsie is in sharp contrast to the specially organized and rapidly moving Port Authority work. But it may be that public initiation and prosecution of such enterprises can be improved nearly to the point of equaling private enterprise. It was in this thought, perhaps, that Governor Smith of New York recently vetoed several private toll bridge bills, both specific and blanket in character, saying that the enterprises should be carried out by the state.

There are thus problems in this field of large bridges, problems other than technical, which still await solution. Progress toward a solution at present is slow. The final result, though it cannot yet be foreseen definitely, is unlikely to be such as to maintain perpetual tolls, but will in due time make the entire highway transport system a network free to travel. Meanwhile much remains to be done before the country's road system will have adequate connection at major streams. Great activity in the building of highway bridges will undoubtedly continue for at least a number of years to come.

Platform Lift on Incline Raises Cars 313 Ft.

Funicular Railway on Seattle's Diablo Dam Project Transfers Freight in Standard-Gage Equipment to Upper Level—Provision for Future Work Warranted Large Expenditure on This Railway

POWER development being carried out by the city of Seattle on the Skagit River in Washington will ultimately include a series of plants and storage reservois of which the second is now under way. The project under construction includes a dam 400 ft. high in Diablo Gorge about 7 miles up the river from the Gorge Creek plant, completed some four years ago. Other proposed



GENERAL VIEW OF INCLINE, TRANSFER PLATFORM IN OPERATION

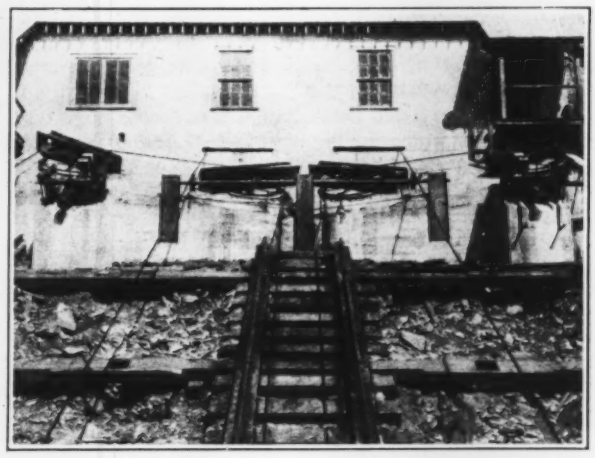
Note approach trestles on both sides that facilitate loading and unloading by single trip of the locomotive.

developments still further upstream made it advisable to build and maintain a standard-gage railway as part of the present work. For this reason the city did not make the construction railway for Diablo dam a part of the contract for that structure but, instead, located and constructed the rail route with reference to the best interests of the chain of future developments considered as a whole. Thus the standards followed were higher than those which would have been justified if the transportation scheme for the Diablo dam had been worked out solely from the contractor's viewpoint. One result of this policy is the substantially constructed incline described in the following, by which a transfer platform carrying a standard-gage freight car, representing a gross load of 79 tons, is transferred without tilting, from the streambed below the Diablo dam site to a level that will permit railroad construction to continue up the canyon when the reservoir is full.

The camp site for the construction of the Diablo dam is located on Reflector Bar, about half a mile below the narrow point in the canyon where the dam is being built. Below Reflector Bar the standard-gage railway threads its way up the canyon not far above water level, but from this point on, because of the great height of the dam, later railroad construction must be at very much higher level. The steep sides of the canyon made any form of switchback construction prohibitive, and final decision was in favor of an incline with a 68 per cent grade that could be located with its foot actually within the Reflector Bar camp and its upper end at a point whence an economical route could be followed past the concreting plant at Diablo dam and later could be extended upstream above reservoir level.

The incline is designed as a funicular railway, the counterweight passing under the transfer platform at the midpoint. The incline length is 563 ft. and the difference in level between the two extreme positions of the transfer platform is 313 ft. This platform was designed to move freight cars from one level to another on a horizontal track, thus avoiding any necessity for rehandling freight into a special car or the danger of shifting loads if standard equipment were to be pulled up a steep incline.

The incline proper consists of three standard-gage tracks, of which the one in the center is used by the counterweight and the two others, whose center lines are 42 ft. apart, support the moving platform, 60 ft. in length, built up of structural steel. This platform is supported on four four-wheel standard, gage trucks,



CLOSE VIEW OF CABLE ARRANGEMENT AT TOP OF INCLINE

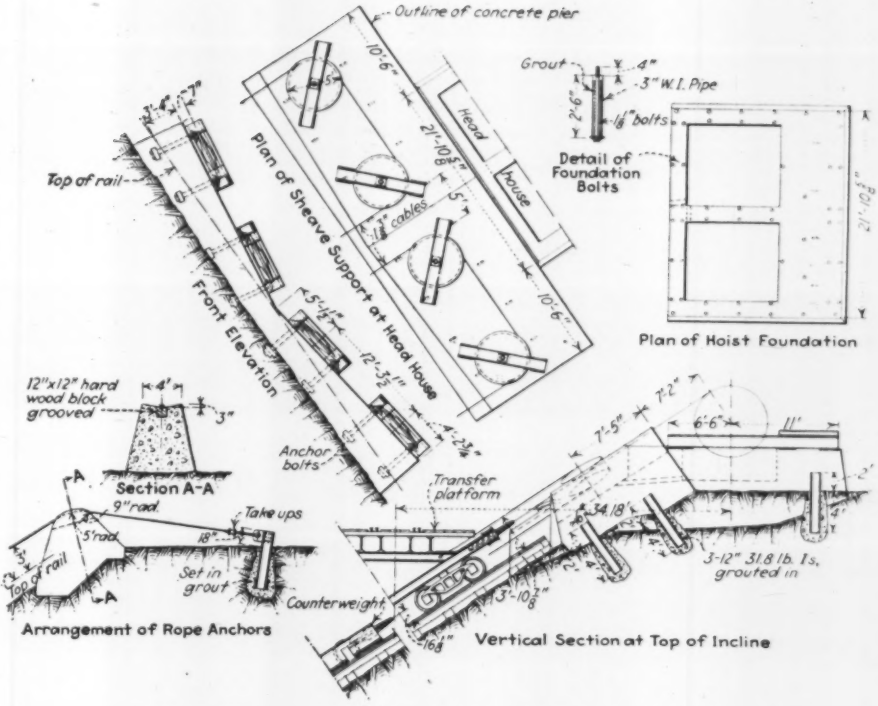
Note pawls that relieve cables from strain while load is moved on or off. Also note higher elevation of outer sheaves.

the wheels having a tread diameter of 24 in. Standard equipment was used as far as possible in all trucks and track work so as to simplyfy construction, maintenance and operation.

The center lines of the three tracks are maintained in the same relative position by 8x12-in. timbers, spaced 20 ft. apart, each of which serves as a tie common to all three of the tracks. Because of a warning that the

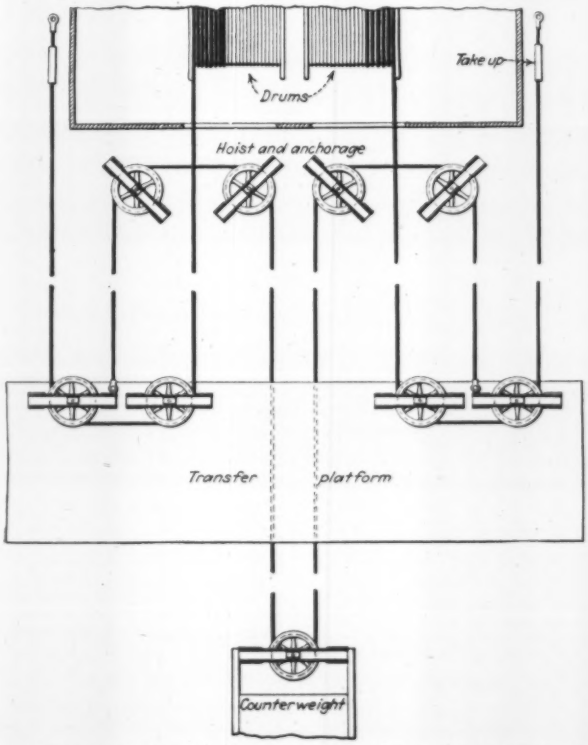
rails would have a tendency to creep downward on the steep incline, each of the rails has a scarfed joint near the bottom to prevent any such creep from causing buckling and to facilitate take-up. However, in June, 1928, after three months of service, no creep had been noted.

At the bottom of the incline it was convenient to arrange trestle approaches at both ends of the transfer platform; thus an empty car brought down from above is pushed off by the locomotive that moves onto the platform with a loaded car coupled behind it, the loaded car being uncoupled on the platform, where it is fastened by rail locks to prevent danger of shifting in transit. At the top this plan was not feasible and a side track is used as storage, two locomotives being used for loading and unloading.



GENERAL ASSEMBLY AND ANCHORAGE AT HEAD-HOUSE

The structural steel frame of the platform was built up of stock shapes, designed to carry safely a total weight of platform and load approximating 79 tons. Clearance beneath the platform is 3 ft. The platform carries a standard single-track railroad trestle deck floored over with 3-in. planks and when shifts change is used for transferring crews to and from the upper levels, as many as 200 men being carried at a time.



SCHEMATIC DIAGRAM SHOWING CABLE ARRANGEMENT

The counterweight, which weighs 45 tons, was constructed on a steel frame, the weight proper consisting of steel punchings with concrete armor, this being the combination which gave the maximum density at low cost. At first the counterweight was mounted on four rigid wheels, but because of the depression in the track near the center of the incline where the counterweight passes under the platform, it was found that due to the rigidity of the frame one or two wheels would rise from the rail head at this point. The two upper wheels were therefore equipped with a special mounting in which the journal bears on a lever, one end of which is carried by an underslung car spring. This spring puts a downward pressure on each wheel that keeps the tread thrust against the rail head at all times. The counterweight is provided with outboard rollers that serve as idlers to carry cables leading to the platform when it is below the counterweight.

The arrangement of the cables is such that although there are eight lines on the incline, only two pass into the head-house, where each one winds over a 7½-ft. drum. The two drums are interlocked to insure absolutely uniform operation of the hoist. Any take-up due to inequalities of stretching in the two cables is made at the anchor points as shown in the accompanying drawings. This is the only adjustment necessary because the counterweight is made self-equalizing by being slung in the bight of the cable.

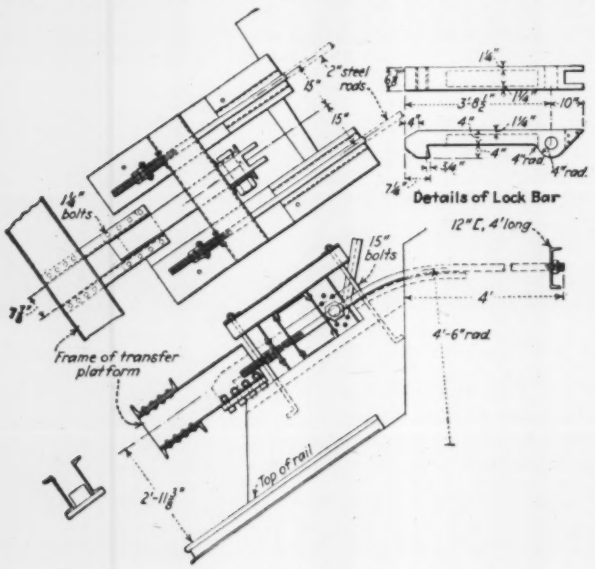
The hoist is operated by a 400-hp. alternating current motor that has a speed of 580 r.p.m. and is geared for platform travel at the rate of 100 ft. per minute. The motor is driven by three-phase, 2,200-volt current, and is equipped with full magnetic reversing control and a solenoid-operated magnetic brake, which sets automatically in the event of current failure. Regenerating con-

trol returns a certain percentage of energy at the same time that it aids in braking.

Nine sheaves, all told, are used: four at the head-house, four on the platform and one on the counterbalance. These sheaves are of cast steel, 5 ft. in diameter, supported in channel-iron frames. The sheaves have machined grooves, $1\frac{7}{16}$ in. in diameter, and are equipped with tapered roller bearings 10 in. in outside diameter with $5\frac{7}{8}$-in. pins. The sheave hubs were made long enough so they could be provided with dust-proof covers which are bored to fit snugly over the pins, but still leaving the whole assembly readily accessible for inspection and oiling.

About 3,500 ft. of cable was used. Specifications called for cable with an ultimate strength of 84 tons having six nineteen-wire strands and a hemp core. Due to the fact that the cables to the platform had to be at a higher elevation above rail head than those to the counterweight, it was considered necessary in order to secure a fair lay of the cable when the car was in the upper position, to set the outer sheaves at the head-house at elevations correspondingly higher than the two central sheaves. This was accomplished by inclining the sheave foundations in two planes as shown in one of the accompanying illustrations.

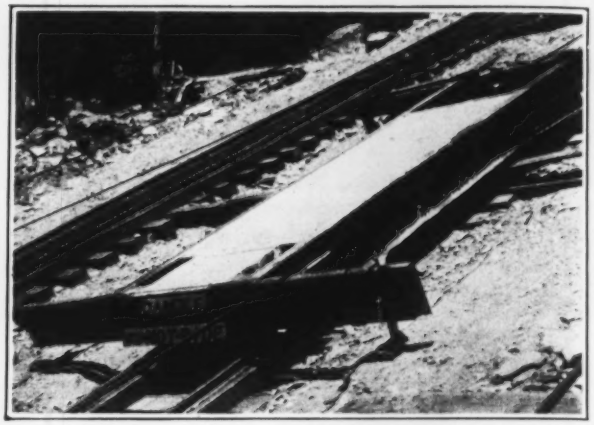
When the platform is at its lowest position, ready for loading or unloading, it rests against a heavy concrete anchor that relieves the supporting cables from strain. This plant prevents the jerking and bouncing that would otherwise result as the strain in the cable is varied by



DETAILS OF PLATFORM LOCKING DEVICE AT HEAD-HOUSE

load moving on or off. At the top of the incline the same result is obtained by heavy steel pawls that automatically engage the steel frame of the platform. When these pawls have dropped into place the operator lowers the platform slightly so that the load is transferred from the cables to the pawls, after which a loaded car can be rolled from the platform with negligible variations of level. The pawls are about 4 ft. long; each one is balanced by a counterweight and is tied back into the concrete anchorage by two 2-in. steel rods, 18 ft. long.

With the 100-ft. operating speed it has been found that a normal round-trip time is about 22 minutes, of which 6 minutes each is required for raising and lowering, and 5 minutes each is allowed for loading and unloading. During the height of the work, when it is expected that about 1,000 cu.yd. of concrete will be poured daily in two eight-hour shifts, the incline can be operated on three eight-hour shifts when necessary. On this basis the capacity of the incline in a 24-hour period, handing cement, sand and aggregate exclusively, would supply materials for 1,600 cu.yd. of concrete.



45-TON COUNTERWEIGHT WITH OUTBOARD IDLERS

The Diablo dam project as a whole is being carried out under the general direction of W. C. Morse, city engineer. T. H. Carver, water supply engineer, is in general charge of the project, with E. D. Alexander as resident engineer at the dam. Most of the details of the incline hoist were developed by J. H. Quense, junior water supply engineer. Construction of the Diablo dam is under contract to Winston Brothers Company, Matt Galvin, superintendent, by whom the incline is operated as a piece of equipment leased from the city.

Key West Prospecting for Public Water Supply

Key West, Fla., which is probably the largest city in the United States without a water-works system, is to attempt to get a supply from artesian wells. Failing this, it proposes to go 120 miles to the mainland, where plenty of potable water is available. At present rain water collected in cisterns is used for drinking; surface wells for bathing and water closet flushing, and salt water from "well hydrants" for fire protection. The latter consists of a well drilled by a rotary drill to a depth of 60 ft., where an inexhaustible supply of salt water is found. A pipe and fire hydrant installed for use by fire engines supply unlimited quantity of water. Similar wells are used in some sections of Miami, Fla., according to C. D. Stevens of that city, to whom *Engineering News-Record* is indebted for the information given in this note. When an ample potable supply is obtained at Key West, a distribution system to supply water for all purposes will be built and a sewerage and sewage-disposal system installed. At present, sewage disposal is by means of septic tanks—built separately for each house. With the provision of an adequate water supply for all purposes, it is hoped that the population, which was 19,945 by the federal census of 1925, will begin to rise. The proposed water supply will be developed by the Munroe Water Supply District, under the direction of three trustees appointed by the Governor of Florida. The office of the trustees is at Key West.

Filter Plant Provides Public Square and Bath Houses

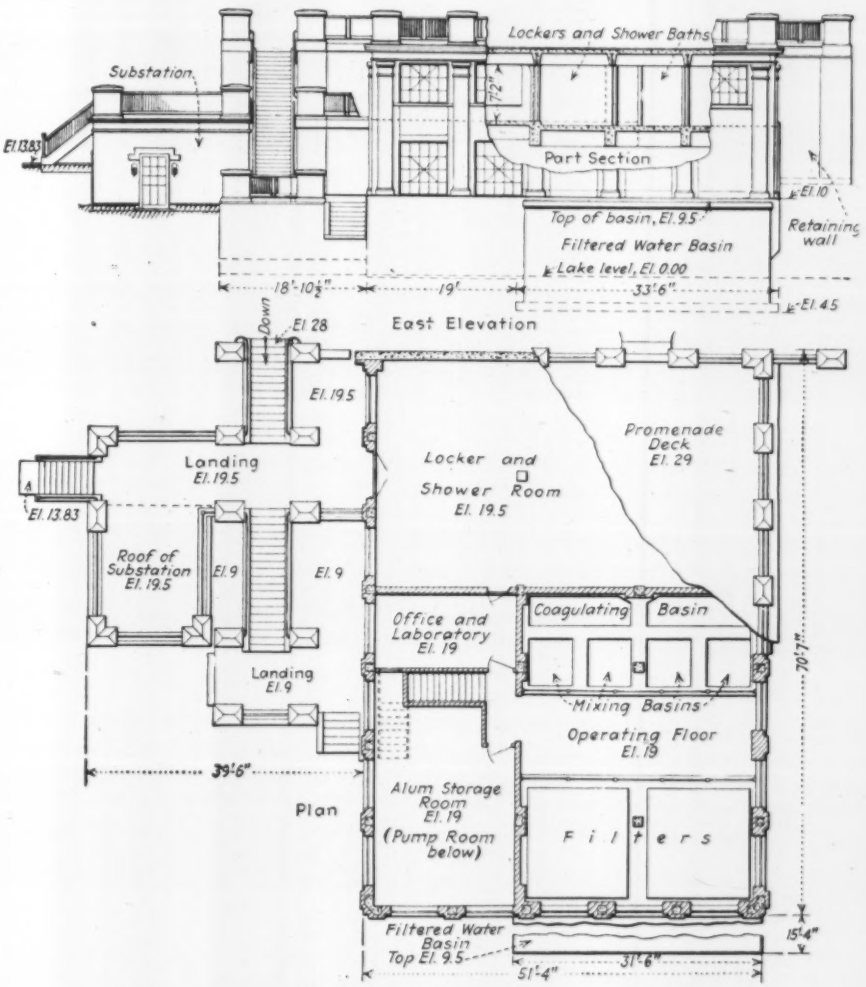
High Maximum Consumption Involves Large Filter Capacity—Lake Front Building Has Roof at Street Level

By Paul Hansen
Pearse, Greeley & Hansen, Chicago, Ill.

NOVEL and unusual features are embodied in the new water-works filter plant and pumping station at Kenilworth, Ill., a northerly suburb of Chicago, on Lake Michigan. The layout and general design are shown by the accompanying drawing. This village has an area of about 1.10 square miles and a population of about 2,500, with a probable ultimate population of 4,000. This ultimate figure is rather definite, because of the impractibility of extending the village boundaries and because of local zoning ordinances and building restrictions. Water will be supplied also to a small unincorporated area known as "No Man's Land," occupied by a moving picture theater, shops, refreshment stands, gasoline stations and a club, while an apartment hotel is to be built. Here the ultimate population will probably not exceed 1,000 or the equivalent in transients.

The estimated average water consumption with an ultimate total population of 5,000 is about 0.5 m.g.d. In summer the suburban communities use great quantities of water for lawn sprinkling, so that the consumption of the maximum day is a relatively high percentage of the average consumption. In this case it has been estimated at 250 per cent of the average consumption, or 1.25 m.g.d. Where the consumption of a community is normal—that is, where the maximum consumption does not exceed 150 per cent of the average consumption—it is usually safe to predicate the capacity of a filter on the average consumption. In communities that have a very high maximum day's consumption the capacity of the filter plant must be predicated on this maximum consumption, with the filters operating at 25 to 50 per cent over capacity. The plant at Kenilworth has been given a nominal capacity of 1 m.g.d., or 1.25 m.g.d. when operated over capacity for a period not exceeding two to three weeks. This will take care of the anticipated maximum day's consumption when the ultimate population has been reached.

The new works will replace the old pumping station and pressure filters, housed in a frame structure. The old works have become quite dilapidated, while the filters did not at all times give satisfactory results in the removal of turbidity. The new plant will occupy the old site, which is at the end of the only street extending to the lake front. As the vista of the lake along this street is very attractive, the village authorities do not wish to have it broken. It became necessary, therefore, so to place the structure that the roof will not be materially above the street level. This was easily accomplished because the street terminates at the top of a low bluff near the lake shore and about 25 ft. above lake level. It was necessary, however, to place the clear-water reservoir at a somewhat greater depth (in wet excavation) than would have been regarded as ordinarily economical.



FILTER PLANT AT KENILWORTH, ILL.

Advantage was taken of the fact that the roof was at about street level to utilize it as an esplanade or summer pavilion, affording an excellent view up and down the shore and out over the lake. The roof deck, paved with tinted concrete or tile and surrounded by an ornamental wrought-iron railing extending between stone pedestals, may be utilized for dancing and various local celebrations. The village authorities also desired to incorporate in the structure dressing-room facilities for bathers. Space for this was found under the promenade

deck and over the sedimentation basins. It is divided into two sections, for men and women, in which ample locker space, shower baths, toilets and other facilities will be installed. The interior as well as the exterior is designed to give a pleasing appearance. Interior walls will be faced with light-colored smooth-face brick and salt-glazed brick, the latter constituting a wainscoting to above shoulder level.

Near the new works is a small brick structure which houses the transformers for electric current used at the pumping station and for street lighting. To make this building harmonize with the more pretentious architecture of the pumping station and filter plant, it is to be veneered with brick and otherwise modified. In addition, a stairway has been designed leading from the street to the beach and also to the pumping station entrance in such manner as to tie the two structures together, thereby giving unity of appearance. This detail has been handled so successfully by the architect that a rather more interesting effect has been secured than would have been the case had not the transformer station been in the way.

The details of the pumping station and filter plant embody no specially noteworthy features. A liberal reaction period of 30 minutes is provided for mixing the raw water with the chemicals prior to sedimentation. This is deemed necessary because of the difficulty of settling out microscopic organisms which occur in the lake water at certain times in summer and which tend to accumulate on the sand beds, greatly reducing the length of runs and putting the sand beds in bad condition. The pumping station, though small, has been carefully designed with a view to placing all piping in pits under the floor where it will be out of sight yet readily accessible. This arrangement will eliminate sweating pipes and improve the appearance of the pump room.

Pearse, Greeley & Hansen, engineers, Chicago, designed and are supervising construction of the new works, with S. M. Clarke as their resident engineer. Arthur S. Coffin of Chicago prepared the architectural designs. The general contractor is Bierd, Lydon & Grandpre, Inc., Chicago.

Alloy Prolongs Life of Waterwheel Nozzles

Stellite, an alloy used extensively where hard, tough steel is required, has been used successfully in resisting excessive wear in impulse wheel nozzles at the Balch plant of the San Joaquin Light & Power Corporation in California. At this plant the water passes through 7⅛-in. nozzles of a 40,000-hp. double overhung waterwheel with a velocity of 360 ft. per second, being delivered under an effective head of 2,243 ft. Although the water is very clean and free from abrasive material, this high velocity had a highly erosive effect on throat rings and nozzles, bronze or cast-steel parts being worn out and requiring replacement in 35 or 40 days. Experiments were made with Stellite, welding it on with an acetylene torch as a surface finish or armor on cast-steel nozzle bases. After being armored in this way the nozzles were put in a lathe and the welded metal was ground to a smooth finish with an emery wheel, the metal being so hard that it could not be worked with a cutting tool in a lathe. Following these successful experiments Stellite was applied to some of the impulse wheel nozzles in the plant. Nozzles on the main unit armored in this way have been in service for two months with no sign of erosion, and similar nozzles on the exciter wheels showed no signs of wear after six months of service.

Structural Steel Cores in Columns of Concrete Buildings

H-Beam Reinforcement in Lower Stories Until Reduced Size of Columns Permits Spiral Reinforcement

By Frank A. Randall
Structural Engineer, Chicago

Because of certain conditions imposed by the city building ordinance of Chicago, we have made it a practice in recent years to design special columns for the lower stories of tall reinforced-concrete buildings. The columns have cores of rolled H-sections with no other reinforcement. These steel sections, or column cores, are employed in the lower stories and extend up to the point where the column-size limits specified by the architect will permit the use of ordinary spirally reinforced-concrete columns. The floor and wall girders framing into the columns are of reinforced concrete, even where the columns are of the steel core type.

A column consisting of a concrete-incased steel or cast-iron core surrounded by ordinary longitudinal rein-

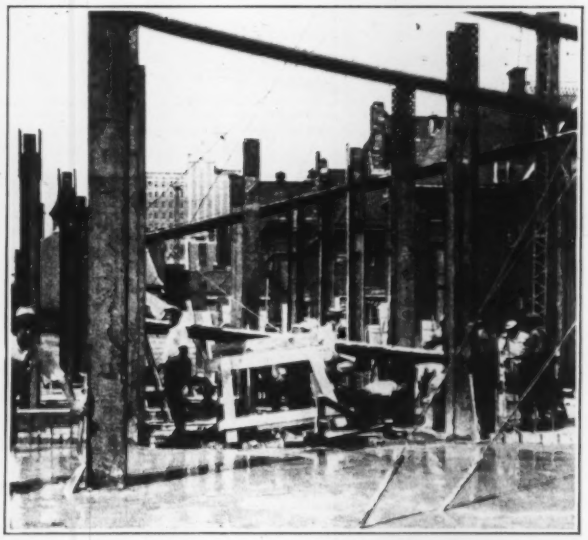


FIG. 1—STEEL COLUMN CORES FOR CONCRETE BUILDING

forcing bars and spirals near the outer edge would be still more economical, if the Chicago building ordinance were to permit the use of the column formula recommended in the American Concrete Institute's proposed standard building regulations for reinforced concrete and in the 1924 report of the joint committee on standard specifications for concrete and reinforced concrete, a formula based on tests that indicate that the strength of a concrete-incased steel column is the sum of the strength of the steel section acting alone as a column and the cylinder strength of the concrete.

A rule-of-thumb provision in the Chicago building code, however, precludes the employment of the latter type of column. The code specifies that where a structural steel column has a minimum covering of 3 in. of concrete, the compression in the column, expressed in pounds per square inch, may be $18{,}000 - 70\ l/r$, but

not more than 16,000 lb. per sq.in. But the designer may not consider the concrete as carrying any part of the load. The designer has the alternative of considering the structural steel section as a part of the concrete reinforcement, along with such longitudinal reinforcing bars as he might wish to add; but in that case the building ordinance would compel him to figure the compression in the steel at the amount expressed by the modulus ratio n times the stress in the concrete. This would mean a low working compressive stress in the structural steel section and would produce an uneconomical column. The many tests made on full-size concrete-incased steel and cast-iron columns show that such a column acts as a structural unit and that the modulus of elasticity is different from that of concrete alone.

In our designs the interior columns usually are limited to certain sizes. For instance, in the 22-story reinforced-concrete apartment building known as the 1400 Lake Shore Drive Apartments, in Chicago, the size limit for

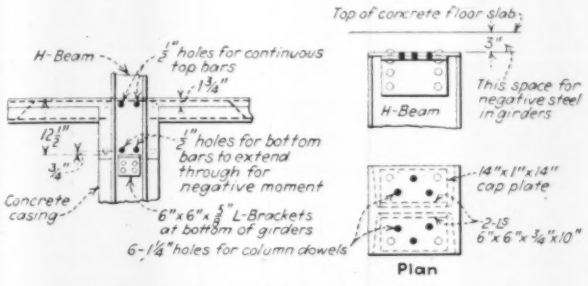


FIG. 2—DETAILS OF STEEL COLUMN CORES
At left, connection of concrete girder to steel H-beam in column. At right, cap on steel column core.

interior columns was 19x19 in. This was somewhat less than usually specified. The building ordinance gives recognition to strengths of concrete up to 2,900 lb. and permits as much as 8 per cent of longitudinal reinforcement in spirally reinforced-concrete columns. While the load which the Chicago ordinance permits a column to carry is not so great as would be obtained from the formula recommended by the American Concrete Institute and the joint committee report of 1924, it is about up to the average of our large cities. Consequently we were able to utilize ordinary spirally reinforced-concrete columns down to levels ranging from the sixth to the ninth floor, below which we employed 12x12-in. steel H-sections. The details of these concrete-incased steel cores present no particular difficulty, but their description should be of interest to designers.

We design column sections in two-story lengths. At one time we considered the advisability of avoiding splices by using column lengths of 60 to 80 ft., but we concluded that the additional difficulties encountered in erection would more than offset the advantages gained in eliminating the splices. We have adhered to the two-story lengths and have found that sections of this length are convenient enough to handle. In Fig. 1 is shown a group of column cores erected in advance of the concreting, at the apartment building mentioned above.

At each floor we attach brackets on a level with the bottom of the floor and wall girders framing into the columns. This detail is shown in Fig. 2, which shows also that half the longitudinal reinforcing bars in the top and bottom of the girder are passed through holes drilled in the steel section. The other half of the girder reinforcement passes on the outside of the steel core. This is possible from the fact that the thickness of concrete outside the steel is not less than 3 in. In Fig. 2 is also shown the detail at the point where the steel core is discontinued. To get an effective splice between the concrete-incased steel core and the true reinforced-concrete column above this level, a cap or plate is riveted to the head of the core. This plate has six drilled holes for the insertion of steel bars 80 diameters in length, which serve as dowels and form an effective tie between the two types of columns.

The economy of this type of column design lies in the fact that full advantage may be taken of the economy of the true reinforced-concrete structural frame, which can thus be utilized for the floor system of the entire building and for the columns of the greater portion of the building. Steel erection problems are quite simple as compared with those of a complete steel frame, and errors made in the shop are much less serious in their results.

The architects on the structure mentioned in this article were Hooper & Janusch, Chicago.

Planning a Municipal Airport for Sacramento, Calif.

Problems of Location, Drainage, Surfacing, Lighting and Plan of Operation Were Referred to Engineering Department

THE RAPID development of commercial aviation has made it necessary to provide a municipal airport at Sacramento, Calif., for both commercial and pleasure craft, and the task of finding and developing a suitable location was assigned to the city manager and the engineering department. Progress on the plan thus far is outlined in the following through the courtesy of Major Charles R. Blood, assistant city engineer.

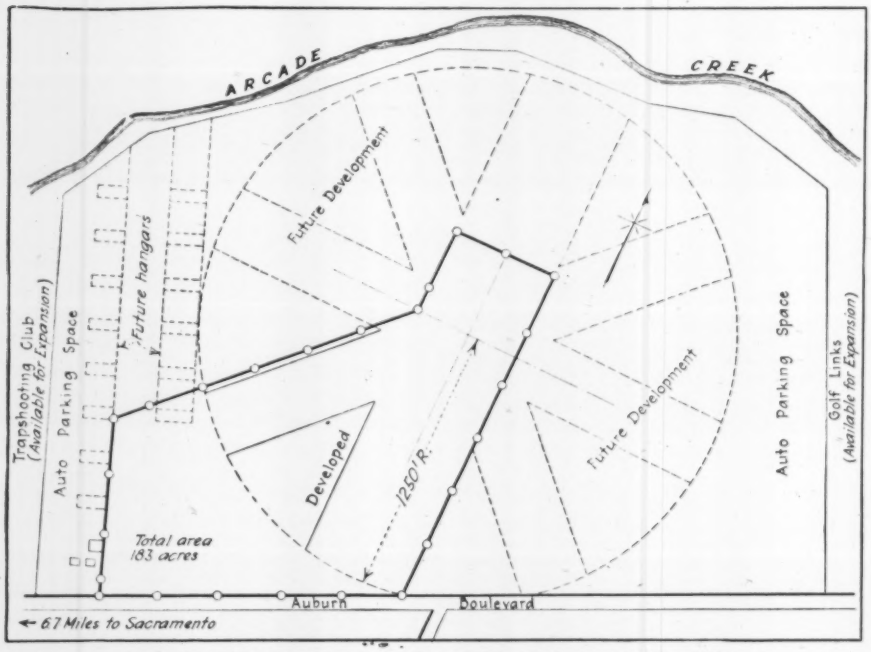
The city manager form of government under which Sacramento operates made for an analysis of the problem from a conservative and economical viewpoint—that is, the over-enthusiasm of a small group did not launch the city into a bond issue for airport development. Due to the fact that Mather Field, maintained by the army, is only 11 miles from Sacramento and to a certain extent has been available to privately owned planes, it

KEY MAP SHOWING LOCATION OF SACRAMENTO AIRPORT

was not necessary to make hasty decision or otherwise to hurry the development of the municipal field.

All possible sites for an airport within a radius of 8 miles of the business section of the city were considered. An 812-acre tract purchased by the city in 1921 for future park development was found to be favorably located and a 184-acre area within this park was selected as the airport site.

This area, without unreasonable expense, can be leveled and drained so it will meet all basic requirements—namely, there is freedom from obstacles; it adjoins a main paved highway; the surrounding park area could be used for further expansion and will prevent for all time development of artificial hazards; the area can be served with high-tension power lines from a direction that does not introduce any hazards to flying; pure, soft water is available from wells, and dependable communication and transportation facilities between this point and the city are already in service.



ARRANGEMENT OF PRESENT AND FUTURE IMPROVEMENTS

In April last year the city council adopted a resolution setting aside the site as an airport and sufficient money was made available from the general fund to grade and level a portion of the field and to install a lighting system. The problem of financing the full development has not been settled, but the plan is to develop slowly and as nearly as possible on the pay-as-you-go plan. It is believed that the expenditure of a sum equal to the present value of the land, about $100,000, will be sufficient to grade and drain the airport.

Draining and grading the field presents a difficult problem in that the soil consists of a red clay over a thick stratum of hardpan. Water does not drain through the surface soil, the depressions holding rain water until it is evaporated. This condition necessitates very careful leveling to facilitate quick runoff.

The natural drainage of the field is toward a creek on the north side. It is proposed to grade the field so there will be a uniform slope toward the creek and also to give the runways a slight crown, picking up the water drained from these areas in parallel surface drains on either side that will discharge to main drains at right angles to the runways. These surface drains are to consist of lines of drain tile placed in shallow trenches filled with crushed rock or gravel.

When the clay surface is dry, a fine red dust is stirred up in dense clouds by air currents from the propellers. Treatment of the area in the vicinity of the hangars with light oil as a dust palliative is planned, and experiments are being made with oils of different asphaltic content to ascertain which are the most effective.

There are natural landmarks near by such as two rivers, the main state highway and the main line of the Southern Pacific Railway that will help aviators locate the field. It is also at sufficient elevation to be above the heavy fogs that sometimes occur along the river bottoms.

Ultimately the developed area will have a circular shape, 2,500 ft. in diameter. The main runway, 500 ft. wide, which is located in the direction of prevailing winds, is to be constructed with the first funds available; then runways 300 ft. wide at 90 deg. and 45 deg. angles to this main runway will be included, as well as such other additions as are found desirable.

Lighting equipment includes a beacon of the type prescribed by the Department of Commerce, boundary obstruction and approach lights, twin floodlights for landing, taxi-lane floodlights and a ceiling light. The latter with a beam candlepower of 400,000 is projected on a 45 deg. angle to the under side of the fog bank. The distance from the base of this beam to a point directly under the reflection of the light on the fog bank is the same as the height of the fog bank—that is, the "ceiling height," about which there is a frequent call for information.

Management of the airport has been turned over to a company formed by a group of local aviators who are conducting an aviation school. This organization, which pays the city a small monthly rental for the use of the field, has provided hangar space and maintains such facilities as a headquarters building, a gas and oil station and a restaurant building. This plan of operation helps out in the expense of maintaining the field and gives the city the benefit of expert attendants at the field which would involve a considerable payroll if undertaken as a municipal service.

Because of the location on important airways there is every prospect for extensive future development. Nevertheless, it is believed that the airport should be developed gradually as the commercial demands increase, avoiding burdening the taxpayers with large bonded indebtedness for immediate improvement beyond present needs. It is not expected that the field can be made altogether self-supporting for some time, but for the present the general fund appropriations will be sufficient and when a bond issue becomes necessary it is not believed that this will have to exceed $500,000.

Sewage Treatment in the Light of European Practice

Observations at 25 English and German Cities Show Sludge Disposal Still Chief Problem—Activated-Sludge Process Making Substantial Progress, but Best Method of Aeration Undetermined

By George B. Gascoigne
Consulting Sanitary Engineer, Cleveland, Ohio

Seventy Years Ago E. S. Chesborough went to England to get information for use in designing a sewerage and sewage-disposal system for Chicago. Since that pioneer trip many an American engineer has gone to England and the Continent of Europe on a similar trip in behalf of a single city or for the benefit of his general practice. Observations on a number of such journeys have appeared in our columns. Herewith Mr. Gascoigne gives another of these series of observations, taking up progressively the various elements of sewage treatment designed to attain partial, more complete and full treatment, and closing with general conclusions.
—Editor.

During February and March the writer visited 25 municipal sewage-works in England and Germany and observed their operation and accomplishments. These works are considered in those countries and in America to be representative of the types of methods used to solve the various sewage problems existing there. Altogether, they serve a total population of some 6,000,000 persons. It was fortunate that I was able to visit all of these works, excepting one, under good weather conditions.

It is to be understood that inspections do not necessarily disclose all of the facts. However, an attempt was made to observe conditions with a perspective not out of focus, especially as to the application of European practice to American conditions. Inspection of the various works was made possible only by the marked courtesy of the officials in control. The strikingly high character and ability of those in charge of operation made discussions of technique both pleasant and informative. Everywhere there was found a frank and free offering of available information. These conditions make for the visitor play out of otherwise hard work.

Any commendation in this article is not intended to flatter nor is any adverse criticism intended to rankle, and certainly not to reflect adversely upon the suitability of certain devices where used. It is intended to be serviceable in suggesting to those concerned possibilities for improvement.

Steps in Sewage Treatment

In order to dispose of the objectionable substances of sewage in a sanitary and an economical manner, various degrees of treatment or purification have been developed from time to time. For clearness and convenience in this article, these steps or degrees may be classed progressively according to their accomplishments, as follows: Preparatory, partial, colloidal, oxidation and germicidal. In addition to satisfactory treatment of the liquid portion of sewage the deposited solids, commonly called sludge, must be disposed of.

It is a sad commentary upon the art that in the present-day application of the degrees of purification just enumerated not only is the sanitary disposal of sewage sludge neglected but experimental and demonstration efforts to that end are lacking both in Europe and in America. It is fitting that present-day endeavors should be directed to obtaining a clean grit, making separate digestion of sewage sludge customary, using artificially made rivers for aerating sewage, producing sewage gas upon a commercial basis, and disposing of phenolic wastes in quenching plants, all of which may be termed perfecting schemes. It is also necessary that serious effort should be directed toward reducing the volume of wet sludge to be disposed of in all sewage-works without nuisance. In a very small proportion, say 10 per cent, of the population served by the works I visited was this last requirement being met, and this is true not only in Europe but also in America.

Character of Sewage and Flows

In England, sewage flows amounting to three times the dry-weather flow are usually given complete treatment, whereas stormwater or flows between three and six times the dry-weather flow receive partial treatment in sedimentation basins. This requirement of the Ministry of Health is an extremely important factor in bringing about the balancing of the fluctuations in flows and the wide variation in the characteristics of the sewage. In Germany large watercourses are near most of the populated centers; therefore, only preparatory or partial treatment of the sewage is required. This will not always be true, so experimental and demonstration efforts along additional or colloidal treatment lines are being carried out in some localities, particularly in the Essen district. There sewage flows twice the dry-weather flow are treated. There also are demonstrated balancing basins to store temporarily and to release into the sewage works, at low-flow periods either by gravity or pumping, the excess flows and sludge from the smaller storms. This procedure, which is being developed by Imhoff, appears to be one of the very good solutions of the stormwater treatment problem.

Sewage reaching treatment works in England has roughly twice the strength of American sewage, and practically all of it comes from combined sewer systems. This is due to the low domestic use of water and the fact that industrial wastes ranging in volume from 25 to 50 per cent of the sewage flow reach the works. German per capita sewage flows vary widely. This is due primarily to the survival of many individual cesspools which discharge into the sewer system and which serve substantial populations in many of the larger cities. Strenuous efforts are being made to overcome this antiquated practice; outstanding is the case of Stuttgart, where a

property owner is paid a substantial sum to discontinue using his cesspool. Also, the city makes the new connection to the sewer system, and the procedure has produced remarkable results. When conditions are normal, sewage flows are quite similar in amount to those found in America, but the strength of the sewage is somewhat greater, especially where some unusual conditions exist such as the beer industry of Munich. It is proper to assume for general purposes that German sewages are comparable to American.

In evaluating European and American sewage-treatment practice, a great deal of weight has been given to the fact that the two sewages are radically different. While this is true to a certain extent, the writer is not so sure that many of the departures he saw can be properly accounted for by the difference in the character of the sewages.

Preparatory Treatment

For the purpose of providing preparatory treatment or removing the floating solids, grit and oily substances of sewage, all of which interfere more or less with the efficient operation of devices that actually accomplish purification, bar gratings, grit chambers, oil catchers and fine screens are used. In some plants the use of all four devices occurs, but ordinarily the oil catcher and fine screens are omitted.

Bar gratings are used always in both large and small works, and are usually mechanically cleaned. An outstanding example of bar gratings of a simple and effective design for large works are those by Keppner at Munich. They comprise vertical rods across the flow channel and are cleaned while in operation. This is accomplished by intermittently raising a wide plate, with holes fitting snugly about the rods, from the bottom of the flow channel through the sewage to an operating floor above. The screenings are collected upon the plate and when it reaches the operating floor they are brushed off by hand into a concrete collecting trough. The Hartley gratings at Leeds are noteworthy, especially their automatically controlled operation and cleaning. For smaller works the mechanically cleaned Geiger bar grates installed by Sohler at Stuttgart are good. This grating does not occupy much room, can be installed in flow channels already built, and should be inexpensive.

Grit chambers, commonly called *detritus tanks* in England, when viewed from the standpoint that an acceptable grit should contain not more than 10 per cent of organic matter, are practically unknown in Europe. This requirement permits the use of grit and its disposal without odor nuisances. Installations producing a clean grit exist in the Essen district. Also, the new layout at Leeds and at Bolton, England, and that at Zurich, appear to be efforts more in line with modern American practice. There are many installations where the retention period ranges from 30 to 60 minutes, resulting in a grit that would be offensive during disposal. However, in most of the larger works very effective mechanical equipment is used for cleaning purposes.

Sohler at Stuttgart is washing or cleaning mechanically the deposited grit, which contains considerable organic matter, and is selling the cleaned material for various uses. At the Essen Rellinghausen Works a clean grit is obtained by aerating the sewage in the oil catcher, which is located ahead of the grit chambers.

Oil and grease catchers, for removing the slugs of mineral oils, which are being discharged intermittently at almost all sewage-works, are receiving consideration, particularly in Germany. At present, attention is centered upon aeration of the sewage just as it enters a plant or prior to removal of grit, with the purpose of separating the oil and grease which may be either floating on the surface of the sewage or submerged and attached to the grit or suspended matter particles. This agitation, which occurs only in the central portion of a rather long, shallow tank but throughout its length, frees and raises the oil and grease so that it passes over or through openings of floating weirs into collecting channels which are at the water's surface and along each side of the tank. The channels lead to a sump, from where the concentrate will be either pumped or flow by gravity to settling basins, where the separation of the entrapped water will occur. This method of de-oiling sewage is not new and its practical use still involves working out the proper solution of many essential details. The need for improvements in this respect are real.

Fine screening of sewage is quite unusual in England, but there are some installations in Germany, particularly in the Rhine districts. There fine screens are used for removing the coarser floating solids from sewage prior to its discharge into large bodies of water. They are not used to reduce the load upon sedimentation tanks nor to prepare sewage for activation. Dorr and Reinsch-Wurl screens are used with results the same as in America.

Disposal of Grit and Screenings—At the larger works, grit with excessive quantities of organic matter is disposed of with the fresh or partly digested sludge. Screenings are disposed of in a similar manner. This procedure is offensive and unsightly. In the smaller works, grit and screenings are piled, sometimes for long periods, and then buried. Imhoff has made some successful experiments in digesting screenings and is now ready to install a demonstration plant to develop the difficulties of plant operation. The disposal of oil and grease collected from skimming tanks or oil catchers is a problem for future solution.

Partial Treatment

In Europe, the partial treatment of sewage, or a reduction in its oxygen demand of about 35 per cent, occurs after some kind of preparatory treatment. This happens mostly in plain and in two-story sedimentation tanks; the former in England with long periods of detention, about twelve hours, and the latter in Germany, with short detention periods, about two hours, both based on dry-weather flows.

The plain tanks are straight-flow, rectangular in plan, with bottoms sloping to the outlet end, and are operated for about a two weeks' period before sludge removal occurs. Some of these tanks are quite old and usually well constructed. They are built of concrete but lined with a vitrified shale brick of blue color, which produces, especially in the newer installations such as at Leeds, a very pleasing effect. The two-story or Imhoff tanks of Germany are well known, but the collection of gas with and without the use of contact aerators and possibly the desire to forestall temporarily the payment of royalty fees (which expire in Germany in 1929) have produced some changes in their design. With gas collection, the importance of scum submergence is appreciated and in the newer installations capped gas vents are located outside the tanks at the ends. When contact aerators are not used, this permits a shallow settling compartment with a large superficial area, and when they are used, construction is materially simplified.

The two-story tank is used at Berlin, Essen district,

for part of the flow at Stuttgart, and at Munich and Zurich. At the latter two places the method of operation such as removing constantly from the digestion compartment some supernatant liquid, about 2 per cent of sewage flow, which discharges into the settled effluent, has the tendency of obscuring this fact. In a general way the same conclusion may be reached regarding the tank specially designed by Sohler at Stuttgart. In Germany, the only instance of settling sewage in plain or separate tanks upon a large scale appears to be at Leipsic, where the English design has been in use for many years.

Colloidal Treatment

In 1916 the writer operated a demonstration activated-sludge plant at Cleveland upon a clarification basis. Since then the demand for a degree of sewage purification which meant a reduction in its oxygen demand of about 65 per cent has been fully appreciated. This means not only settling a sewage but removing most of the colloids and oxidizing about 25 per cent of the dissolved organic matter. Furthermore, the appearance of such an effluent is extremely pleasing to the eye.

In development of the process there are now available three methods of accomplishing the so-termed colloidal treatment, as follows: (*A*) Presettling and activation of the entire sewage flow to clarification basis with reaeration of sludge. (*B*) Presettling of entire sewage flow and activation of one-half of flow to oxidation basis. (*C*) Presettling of entire sewage flow with contact aerators and final settling. There is no need of discussing here the relative advantages and disadvantages of these three procedures, but it is noteworthy that Imhoff, after much experimentation, now has in operation workable plants for determining the essential data of Plan C. Also, Whitehead at Birmingham has been operating for a considerable period of time a sizable plant in accordance with Plan A and the city of Elyria, Ohio, has just placed under contract a sewage-works of this type designed by the writer for 40,000 persons. It is important that the same plant can be used and operated in accordance with both procedures A and B.

Contact aerators, as now used, are built-up boxes of brush, lath or slats, which are inserted in or occupy the middle portion of the flow compartment of a two-story tank. The first third of the tank is used for primary settling and the last third for final settling after the flowing sewage is caused by agitation with compressed air to pass up and down through the contact aerators. The air is used to maintain in an aerobic condition the organisms which develop upon the lath or brush and to cause the sewage to pass over them a great number of times.

The activation of a presettled sewage upon a colloidal basis of treatment is just beginning to receive the consideration to which it is justly entitled. Reduction by digestion in the volume of wet sludge that must be disposed of has assisted materially in bringing this about.

Oxidation Treatment

There is no present need of completely treating sewage in Germany or reducing its oxygen demand content about 90 per cent. For many years the opposite has been true in England. Consequently long operating records are available there for broad irrigation, sand filters, contact beds and trickling filters. At present, oxidation of a settled sewage occurs mostly in trickling filters with final settling, although there still remains in operation some important contact filter plants. In some instances the tendency of the immediate future will be to interpose the activated-sludge treatment ahead of trickling filters, while in others activation will be used for complete treatment. Complete activation is now practiced at Reading and Sheffield, with presettling omitted at the former place.

Trickling filters in European practice are ordinarily shallow or about 6½ ft. in depth with media of gravel, limestone or slag, which on the surface of the filter are about 1 in. in size. Capacities are comparatively low and many features of design and construction are different from those in use in America. Temperatures are relatively high and seasonal changes are not wide. Consequently the lasting qualities of filtering material are not seriously tested by freezing and thawing, and the machinery for operating mechanical distributors is not subjected to severe winter conditions. When it is practicable to use traveling distributors, the latest Hartley type installed at Leeds appears to be very good. The usual odor from atomizing sewage exists and fly troubles occur, since flooding facilities are not available for correcting the latter difficulty. As in America, the dependability of accomplishment is not questioned.

The activated-sludge process in England has and is receiving considerable attention in all its phases and to the extent that it is recognized as a practical method for treating sewage either completely or partly and with an absence of odor nuisances, if the sludge-disposal feature is excepted. Also, with the character of the sewage fluctuating widely and almost hourly, presettling tanks and, in some cases, equalizing tanks are used to smooth out the flows and the quality of the sewage. The exception seems to be at Reading, where, to date, some trouble has been experienced.

It is apparent that the adoption of the activated-sludge process, irrespective of the degree of treatment, permits the maximum salvage from old or existing plants. Old sedimentation tanks and contact filters have been remodeled into aeration tanks, and this fact, in many cases, explains the use of shallow depths for these structures. Certainly this fact has not helped in establishing the full merits of aeration tanks 15 ft. or more in depth. Also, it is difficult to appreciate the wisdom of using long, narrow and very shallow tanks for aerating large volumes of sewage. Converting the old contact filters into the new aerating tanks must have effected a considerable saving in construction cost at Sheffield, where Haworth followed such a procedure.

Systems of Aeration—With a better understanding of sludge digestion and with the inclusion of presettling, the activated-sludge process of treatment has become increasingly attractive and offers possibilities under a variety of conditions. In fact, it now may compare favorably with other equivalent processes when the comparison is inclusive of all the factors. From this viewpoint of widened scope there is much interest in English and German developments. One of the problems upon which evidence is accumulating concerns the method of aeration.

There are three systems of aerating sewage: Surface, diffusion and a combination of the two. The Haworth paddle wheels and the Hartley and Simplex aerators are illustrations of the first, which may be seen in operation at Sheffield, Birmingham and Bolton respectively. The diffusion system of the Activated Sludge, Ltd., type may be seen at Reading and Manchester, while the

combination of surface aeration and diffusion is in operation at Birmingham and the Essen Rellinghausen works. It appears that if any of these systems are installed properly and operated efficiently, good results will be obtained. The factors controlling a selection of any system depend upon a number of conditions, many of which are local. For the large works, it appears that demonstration units should be operated in parallel before a decision is made. It is history with all experimenters in the sewage field that very little oxygen has been taken out of the diffused air in its vertical passage through an aerating tank. The Imhoff system of retarding with paddle wheels increases perceptably this ratio, which is an outstanding advantage of the combined surface and diffusion system.

Final Settling Tanks—In Europe activated and humus sludge is settled in hopper-bottomed tanks, the detention period being about two hours based upon full displacement for the dry-weather flow. Removals are good, especially with the newer designs, as by Whitehead at Birmingham and Imhoff at Essen Rellinghausen. The absence of flat-bottomed tanks for these purposes, with sludge-removal equipment as manufactured by the Dorr Company and used quite extensively in this country, is difficult to explain.

To remove the fine suspended solids from the effluent of the final settling tanks and give it a polishing effect, Whitehead at Birmingham is passing the effluent over a level area which grows a long-rooted type of grass known as "quitch." The effort is extremely noteworthy and is accomplished at slight cost.

Disposal of Sludge

In Europe I have seen sewage sludge produced in quantities that are stupendous, and its disposal attendant with odors and unsightly conditions, by methods that show no improvement from those of earlier years. This experience simply fixes in one's mind more firmly than ever the viewpoint that sewage-treatment methods which produce the least amount of wet sludge at low cost and permit of its disposal without nuisance will become the most favored. The time has gone by for solving the sludge problem in any other than a strictly sanitary manner and the future holds no place for the present sludge-disposal situation, which is not necessary.

Dumping sludge at sea, burial or lagooning on land and use as a fertilizer are the principal current methods of sludge disposal. Ordinarily no dewatering of the sludge occurs with the first two methods, which means the handling of large quantities of wet fresh sludge with a moisture content of about 95 per cent. In Germany use is generally made of the sludge, and the dewatering process includes, first, digestion, then drying upon open beds, and finally its use by farmers as a fertilizer or fill in low ground. In England there are exceptions to dumping strictly municipal sewage sludge at sea and lagooning, principally at Birmingham. Even there the situation exists of de-sludging a tank by decanting the supernatant, the runoff of the more fluid sludge and the hand squeeging of the remainder, which is relatively low, only 3 to 5 per cent, being removed by hand.

Sludge digestion abroad shows a general agreement in practice as regards certain fundamentals. Digestion, to be favorable, must be under alkaline conditions, and optimum digestion is dependent primarily upon mixing —that is, bringing together fresh and digested sludge— and upon temperature. The method of mixing fresh or activated sludge with partly or fully digested sludge varies, the tendency in Europe being to let this occur automatically or naturally, as in two-story tanks, while at present artificial means seem to be preferred in some instances in this country. The two-story tanks in the Essen district, the Stuttgart tanks, the modified two-story tanks at Munich and Zurich are places where the former plan is carried out. The primary digestion tanks at Birmingham are an example of the latter method. There the procedure is exposed to view, which is not a very pleasing sight. However, floating gas-collecting hoods are being placed in the secondary digestion tanks, which will lessen this objection somewhat.

After primary digestion is started or is well on its way, oftentimes the partly digested sludge is removed by pumping or by gravity to secondary digestion tanks, where digestion may or may not be hastened by heating. Naturally, the capacity required for digestion depends upon the time of digestion, which in turn depends upon maintaining optimum temperature conditions. A sludge temperature of about 21 deg. C. seems to produce the best results and the measuring stick is the rate of gas production. Two-story tanks utilize as far as possible the head of the sewage and produce a sludge for secondary digestion with as little water as possible.

Heating of the sludge is obtained variously by means of passing hot water through pipe coils located in the digestion tanks, by pumping hot water into the bottom of the digestion tank and by heating the excess activated sludge on its way to the digestion tank. Each procedure has its particular advantages and disadvantages, but the hot-water plan without coils seems to reduce to a minimum the quantity of supernatant liquid that must be disposed of. Ordinarily the supernatant is discharged into the raw sewage as it flows to the presettling tanks.

For combined sewage, capacities of 1 cu.ft. per capita for the primary digestion tank and 1 cu.ft. per capita with heating for secondary digestion appear ample. These figures may be reduced 25 per cent for sewages from a separate system and do not apply to sewages with excessive quantities of industrial wastes. These figures have been used by the writer in the design of the Elyria, Ohio, plant.

The collection and utilization of sewage gas upon a practical basis is the outstanding feature of European sewage practice. It is being done at Berlin, Stuttgart, Birmingham and in the Essen district. When sewage gas is obtained and used to operate engines producing 200 hp. per 24 hours, this phase of sewage-treatment practice has passed beyond the realm of conjecture.

Sewage gas has a calorific value of from 600 to 900 B.t.u. per cubic foot, can be produced continuously at relatively slight cost, has a methane and carbon dioxide content of 80 and 15 per cent respectively, of which the latter may be practically eliminated if necessary, and may be obtained in quantities ranging from 75 to 125 cu.ft. per capita per year. Since the volatile content of organic matter for European and American sewages are comparable within reasonable limits, similar production can be expected in America.

An important angle of gas collection is scum submergence, especially with separate digestion tanks. This submergence reduces the clogging effect, which is of serious consequence if gas is to be collected upon a continuous basis. The present case at Zurich is an example of the difficulties that may be expected when submergence does not exist. The floating cover by White-

head for accomplishing this result is in use at Birmingham, but not in as perfected a form as at Plainfield, N. J., by Downes.

Open sludge-drying beds quite like those in America are used extensively in Europe. Oftentimes the filtering material consists of slag with a top covering of cinders or coal, the cinders being plentiful and cheap in the mining districts. Sand beds are used at Stuttgart, Munich and Berlin, with substantial mechanical apparatus for removal of the dried sludge. Yearly about 30,000 tons of 35 per cent moisture sludge are removed by hand from 66 acres of open drying beds at Birmingham. At Olbach very large amounts of about 70 per cent moisture sludge are removed by hand with cableway transportation from underdrained sludge-drying beds used as short-period settling basins. These are outstanding examples of removing large quantities of sludge by hand instead of mechanically.

Industrial Waste Treatment

Considerable work has been done in Europe upon the treatment of sugar beet, creamery, tannery, textile, wool-scouring, paper, phenolic and other industrial wastes. The efforts of Wottner-Smith at Bradford, where one-fifth of the wool of the world is scoured, of Parsons at Reading and of Imhoff at Mansfeld with phenolic wastes are noteworthy. While much of interest could be said about each of these problems, it is possible here to discuss only one—phenolic wastes.

Eliminating phenolic tastes from drinking waters, when treated with chlorine, has developed quite a history within a few years: (1) Quenching plants were and still are used in this country for destroying these phenols and other tar acids. This procedure has proved exceedingly costly, not only to install but to operate, and is not dependable. (2) In Europe, sewage-works of the oxidation type have handled satisfactorily wastes of this character which did not exceed by volume 2 per cent of the domestic sewage flow and when they were not released in sludge. This has led to the insallation of equalizing tanks at the point of origin for releasing the wastes into the sewer system at a uniform rate. (3) Recently in this country the recovery of these wastes by absorption of the phenols in benzol and by their subsequent recovery of crude phenol has come into use as at the Domestic Coke Corporation, Fairmont, W. Va. The revenue varies somewhat and appears to cover the operation cost but not capital charges. (4) More recently an attempt is being made in England to bring about equipment and process changes in the coking of coal and making of gas which will eliminate these objectionable wastes. (5) At Mansfeld, Germany, Imhoff has installed a treatment works where the wastes, separate from the domestic sewage, with 2,000 p.p.m. of phenols, are first treated in cinder filters. The effluent is then mixed with domestic sewage in the ratio of 2 to 5. This mixture is then given colloidal treatment by contact aerators.

While all of these efforts are commendable, particularly those which permit a revenue from recovered products, the real solution of the usual phenolic waste problem lies in the removal or absorption of these wastes during the process of water purification. There are a number of important reasons for this viewpoint, among which may be mentioned: The amounts of phenols producing objectionable tastes are exceedingly small; many unforeseen acts of commission and omission occur in waste-treatment works which do not permit of very delicate definite control; only after a water supply has reached entrance conduits does it become practicable to actually prevent, correct or eliminate any pollution of this kind; some progress has already been made in Europe toward producing an absorptive in water purification.

General Impressions Summarized

A visitor to European sewage-works is impressed with the scientific efforts directed toward a solution of the sewage problem and with the magnitude of the works now in service. Many features of sewage treatment, observed in practice there, merit particular consideration in America. However, in an article of this kind it is impossible to cover all points deserving mention. Some of those which are receiving current attention in America are summarized:

As conditions affecting both construction and operating costs are so widely divergent in the various countries, no attempt has been made to make comparisons with costs here. It is evident, however, that in Europe, once a disposal scheme is deemed necessary, the practice is to provide adequate funds for substantial construction and effective operation.

The chlorination of sewage, for the purpose of germicidal treatment, is followed usually only in cases of emergency; also, it is not used for deodorization, although its possibilities in this field are fully appreciated.

Local farmers, as a rule, recognize the value of dried sludge as a fertilizer, and will take all that can be obtained. The sludge has no greater nitrogen content than similar sludge available at many of our American works.

Practically all sewage-works are confronted with the oil problem, but as yet no wholly satisfactory solution has been found. It is generally recognized, however, that all treatment projects should include allowances for space and operating head to accommodate devices for the removal of oil and grease.

At present the disposal of phenolic wastes is best accomplished by their inclusion and treatment with domestic sewage. This involves, sometimes, the necessity of equalization of flow, by storage at the source, and controlled discharge. Means for certain elimination of these wastes from drinking water is being sought in the development of a suitable absorptive to be used in connection with regular purification processes.

Progress in the development of the activated-sludge process is substantial. The presettling of sewage prior to activation and the digestion of the excess activated sludge mixed with the sludge from presettling have made the process attractive for a variety of conditions. Furthermore, its elasticity, permitting either colloidal or complete treatment, to suit the requirements, should prove advantageous in a number of instances. The best method of aeration is still to be definitely determined. Diffusion, surface aeration and a combination of the two are all effective and each has its adherents and advocates.

For the optimum digestion of sewage sludge as measured by the quantity and quality of gas produced, the tendency in Germany is to mix fresh solids and digesting sludge by natural means in the course of settling, instead of by removal of fresh solids to separate digestion tanks as often advocated in this

country. Secondary digestion in separate tanks provided with heating facilities is done frequently with good results. The collection and utilization of gas is becoming more and more a part of all treatment works.

The chief problem of sewage treatment still relates to the sludge. It must be disposed of in a sanitary manner and efforts directed toward reducing the quantity of wet sludge should be greatly encouraged.

In conclusion, it is a pleasure to acknowledge and record indebtedness and appreciation not alone to those mentioned by name in the body of this article but also to the many other officials and engineers, all of whom so kindly received the writer and so generously furnished him with valuable data and information.

Some Recent Points Decided in Engineering Law

REVIEWED BY HERBERT BRAASCH
Attorney-at-Law

PREVIOUS CASES in engineering law appeared in *Engineering News-Record* May 24, 1928, p. 817. In these periodic articles decisions are reviewed of cases tried in the higher federal courts and the state supreme courts. —EDITOR.

Extras

A contract for building foundation caissons provided extra payment as shown in Schedule I for "increased volume" if caisson dimensions were increased. Schedule I also contained unit prices for many items of the work. The basement floor grade was to be the starting point, and the contractor was to be permitted to leave excavated material on the site as dumped. Revised plans increased caisson dimensions, making necessary additional excavation in some cases. After completion the owner claimed that "increased volume" restricted extras to cubic yards of materials handled, while the contractor claimed the excavation necessary in placing this material as well as the back fill was part of the "extra." The contractor prevailed.

When work was begun the site was crowded with derricks and excavated material, and since the contractor had no room left to dump on the floor grade without hindering his progress he removed the materials from the site. The court allowed the cost of such removal, interpreting as in the contract an implied obligation on the part of the owner to supply a dumping place.—*Charles R. Gow Company vs. Marden, Massachusetts.*

Time-Card Data as Evidence

The contractor, in the case described above, in order to show labor costs, measurements, etc., produced in court the timekeeper who checked the men on the job. On the back of the time cards the timekeeper had entered measurements made by the foreman and himself; on the face he had entered the usual time items. These cards were admissible evidence of all the information contained on them, both of labor costs and measurements.—*Charles R. Gow Company vs. Marden, Massachusetts.*

Joint Undertakings

Architects Newhall and Blevins were associated in preparing sketches, drawings and specifications for a building, payment according to the American Institute of Architects schedule of 6 per cent—one-fifth for preliminary studies, two-fifths for working drawings and two-fifths for superintendence and details. They agreed to split the fee. While plans were in progress Newhall died. Blevins and the owner then made a new contract under which Blevins completed the work. Newhall's estate sued to recover half the fee.

The court in considering the case held that Newhall and Blevins were joint venturers, not true partners. An implied condition of their contract was that death of one party would terminate it. The Newhall estate was entitled to half the fee as earned up to the time of Newhall's death. The contract of Newhall and Blevins with the owner was one for personal skill and ability, as a contract of an artist to paint a picture. It, too, was at an end with Newhall's death. A fifth of the fee had been earned; all other liabilities and obligations were ended.

There being no contract, Blevins and the owner were free to enter into a new one in which it was exclusively Blevins' skill and ability that were contracted for.—*Stearns vs. Blevins, Massachusetts.*

Foreman May Bind Contractor by Purchases

Brewster furnished plastering materials for a construction job, and charged the supplies to the sub-contractor of that portion of the work, according to instructions from the foreman of the general contractor. The foreman stated that the sub-contractor "fell down on the job" and that although "they wanted to keep the accounts on the cost of that work separate, the general contractor would pay."

The foreman had no authority to buy materials. The custom was for the contractor to make the contract for them and the foreman to order them as the work progressed. The court held the orders placed by the foreman were within the apparent scope of his authority to direct the work and order out materials as needed on the job. The material man's claim was allowed.—*Stewart McGehee Construction Company vs. Brewster, Arkansas.*

Surety Not Liable for Loans to Sub-Contractor

A sub-contractor gave bond to the general contractor for due completion of a project. The latter to facilitate work made advances to the sub-contractor before they were due on the bond and contract.

The bond, containing the usual provisions, provided that "in event of any default a written statement of the particular fact showing such default and the date shall be delivered to the surety." By the bond the contractor was also to retain 10 per cent of payments due the sub-contractor from time to time on estimates.

Decided, the surety is released of liability to the extent the contractor failed to retain 10 per cent of the payments due the sub-contractor, unless the surety assented. This would not apply where there are special reasons why the surety should be held.—*Paxton vs. Spencer, Utah.*

Contracts for Drawings

An architect, Gerber, made sketches and drawings for an apartment house on a lot owned by Weinstein. The contract under which the plans were prepared was oral. To the architect's action for his fee, the owner answered that the contract was for the sale of goods—that is, the sale of the plans and drawings—and by the sales act must be in writing. The court held it was an agreement for work, services and materials to which the necessity for a writing did not apply.—*Gerber vs. Weinstein, New Jersey.*

City Inspection of Concrete in Building Construction

Detroit Keeps Records of Test Cylinders and Inspects Forms, Shoring, Placing Steel and Pouring Concrete

How CONCRETE used in building construction at Detroit is inspected, tested and recorded by the city during the progress of the work was described by John M. Bischoff, commissioner of the Department of Buildings and Safety Engineering, at the recent annual meeting of the Building Officials Conference. The substance of his paper is given below, with examples of the record system. —EDITOR.

INSPECTION of concrete building construction in the field was inaugurated at Detroit, Mich., in 1918 by the Department of Buildings and Safety Engineering, and in 1920 the department established a completely equipped testing laboratory. The field inspector for the department must pay careful attention to the selection of the fine and coarse aggregates or the quality of the concrete will suffer. To determine the suitability of these materials, sieve tests are made, from which the fineness modulus is obtained. This simply is an index of the size and grading, which indicates the proper aggregate for use in concrete according to a given specification.

When a permit for a concrete structure has been

Detroit, Mich., ... 192....

Department of Buildings & Safety Engineering,
Division of Concrete Inspection.

An inspection is requested on reinforced concrete construction of

.....job, located on

.....st., bet. .....st.

and.....st.

Contractor..... Supt.....

Inspections made within 24 hours after receipt of request. All R. C. Construction must be inspected and approved after forms and steel are in place and before pouring.

FIG. 1—CONTRACTOR'S REQUEST FOR INSPECTION

issued, the concrete inspector in the division of concrete inspection is notified by the permit and structural engineering divisions. He then makes a preliminary examination of the material, at which time he leaves a supply of the addressed postcards shown in Fig. 1. If he is doubtful about the quality of the aggregates proposed to be used, he will make preliminary tests before concreting is started. As the job progresses, the contractor's superintendent notifies the department by these cards when he is ready to place concrete, so that the inspector may be on the job at the proper time.

After concreting gets under way, test cylinders are made from the material actually being deposited, under the supervision of the inspector, who attaches a tag to the test cylinder. This tag contains a complete record of the proceedings. The cylinders are allowed to remain on the job until they have attained their initial set. In the meantime the inspector has notified the laboratory by means of a card, showing where the cylinders are to be picked up. During the busy season between 40 and 50 cylinders a day are received from various parts of the city.

Laboratory No. .....
Job .....
Location .....
Contractor .....
Location of Pour ..... Mix .....
Date of Pour ..... Date of Test .....
Inspector .....

CONCRETE CYLINDER FOR LABORATORY TEST
BY DEPARTMENT OF BUILDINGS

This Cylinder must not be moved until sufficiently set up and then placed in superintendent's office until called for by this Dept.

DEPT. OF BLDGS. AND SAFETY ENGINEERING
Clinton and Raynor Streets

FIG. 2—CARD ATTACHED TO TEST CYLINDER

To insure that the right cylinders are collected, the tag has the signature of the superintendent or his recognized representative, and also that of the inspector. Every cylinder is signed for in the same way, thus eliminating all chance for confusion or controversy. On the reverse side of the tag are printed instructions as to the handling of the cylinder tests. As a rule, two samples are taken for about every 100 cu.yd. of concrete poured.

Identification cards which the inspector attaches to the paper molds used in casting the test cylinders are shown in Fig. 2. They are attached in such a way that the wire becomes embedded in the concrete, so that the tag is effectively secured to the cylinder.

With the number of cylinders received, it is necessary to adopt some system whereby we know the status of each. The laboratory master record which is kept for that purpose is shown in Fig. 3. This is a sheet 9x6¼ in., with a perforated stub. In the upper right-hand corner is a serial number, and this is also painted on the top and side of the cylinder. The data on the tag accompanying the cylinder are transferred to the master record. We then have a complete record in a permanent form and an identification mark on the concrete sample. The tank or curing vat in which the sample is placed is recorded, so that any cylinder can be located during the 28-day curing period.

SUMMARY OF CONCRETE TESTS: 1927

Range of 28-Day Compressive Strength In Lb., Sq.In.	—Number of Tests Falling Within Range Indicated— In Floor Slabs	In Footings	In Columns	In Foundation Piers	In Retaining Walls
Under 1,000	0	0	0	0	0
1,000-1,500	8	2	0	0	0
1,500-2,000	95	11	3	9	0
2,000-2,500	254	37	18	63	0
2,500-3,000	332	30	18	96	1
3,000-3,500	287	42	36	120	3
3,500-4,000	213	37	47	131	4
4,000-4,500	108	42	37	136	5
4,500-5,000	50	32	20	96	2
5,000-5,500	25	13	18	84	3
5,500-6,000	7	5	5	34	5
6,000-6,500	2	0	2	25	3
6,500-7,000	2	2	1	6	3
7,000-7,500	1	0	0	1	1
Total number of tests made	1,384	253	205	801	30

Department of Building and Safety Engineering
CITY SERVICE BUILDING

ANALYSIS No. 102

DATE RECEIVED Sept. 15, 1927
FROM Building Dept. INSPECTOR FOR
2 CYLINDERS CONTRACTOR
LOCATION Floor FOR Blank Theater
MIX 1:2:4
WATER ADDED SLUMP

CONDITION	OK.	OK.	DURATION 28 DAYS
BREAK CLASS	3	4	MADE 9-10-27
MATERIAL	Gravel	Gravel	DUE 10-8-27
LOAD	89,770	94,400	TESTED 10-8-27
AREA	30	30	
LBS. PER SQ. IN.	2993	3147	

CHEMIST

FIG. 3—LABORATORY RECORD OF CONCRETE TESTS

Another record kept in the laboratory is the cylinder record book, by which any specific cylinder test can be located. Then by the serial number allotted each cylinder the master record can be located readily and the data desired obtained. In order to give to the person submitting a sample an idea of the breaks obtained, the laboratory report shows a description of the breakage, the different kinds of breaks being divided into the four numbered classes shown in Fig. 4. The appropriate number is entered against "Break-Class" on the form, Fig. 3.

When cylinders are prepared for testing, they are capped with plaster of paris, which provides a flat surface for the compression face. A 300,000-lb. testing machine is used with a multi-speed motor. It has twelve speeds ranging from 0.017 to 6.5 in. rise or fall per minute.

To stimulate interest in the quality of concrete among architects, engineers, contractors and members of our department, a tabulation is sent out every four months. The first column contains numbers representing the various contractors for whom tests have been made during the four-month period, their names being known only to the commissioner and to the chief chemist of the department. The remaining columns show the number of tests made for each contractor, and the high, the low and the average compressive strength attained by each. This tabulation is made separately for concrete in reinforced-concrete floor slabs, in footings, in columns, etc.

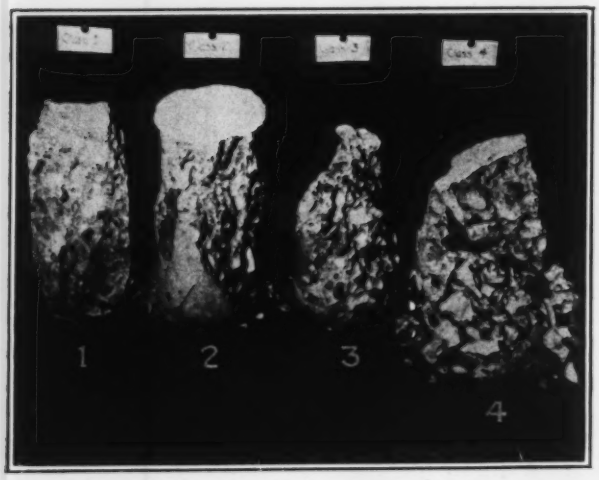


FIG. 4—CLASSIFIED TYPES OF BREAKS
The appropriate number is entered on the laboratory record.

Since the inauguration of this system in 1926 there has been a gratifying increase in the average strength of concrete from year to year. Many of the cylinders test above 5,000 lb. per sq.in. in compressive strength, and a few go as high as 7,000 lb. Of greater importance than extremely high strength, or even a high average, is the fact that for all practical purposes concrete testing from 1,000 to 1,500 lb. per sq.in. has been eliminated. When the system was started, many tests ran between those limits and some were as low as 600 lb. A summary of results attained in 1927 is given in the accompanying table, in which by far the greatest number of tests run from 2,000 to 4,500 lb. per sq.in. The average for all tests made in 1927 was 3,953 lb., as compared with 3,210 lb. in 1926.

Besides the inspection of concrete, the city's inspector must give attention to the plumbness of forms, the placing of steel reinforcement, the length of time before forms are removed, the placing of shoring, the location of cutoffs when concreting is stopped for the day, and protection in cold and hot weather. The reward lies in the confidence in the structural soundness of reinforced-concrete buildings and other concrete structures.

Record Runoff From Black River Watershed, New York

Excess Flow From Melting Snow Checked by Freeze —Good Effect of Reservoirs Encourages Extension of Storage System

By Edwin S. Cullings
Chief Engineer, Black River Regulating District, Watertown, N. Y.

Although somewhat reduced by storage reservoirs, the recent flood on the Black River reached a maximum of 33,900 sec.-ft. at the Watertown gaging station on April 9, 1928. This flow has been exceeded only twice within the known history of the river, once on Dec. 15, 1901, when a heavy fall of snow followed by a rainfall of nearly 3 in. produced a flow of 37,000 sec.-ft., and once on April 23, 1869, when a destructive flood, estimated by George W. Rafter at 39,700 sec.-ft., was caused by the rapid melting of a heavy accumulation of snow accompanied by a 2-in. rainfall over a considerable part of the watershed.

A calculation of the storage in the reservoirs shows that the actual runoff from the tributary watershed was materially larger than the recorded peak of the flood, and it is evident that, had it not been for storage reservoirs on the headwaters of some of the smaller tributaries, a flow of record height would have resulted. On April 7 and 8, from 24 to 48 hours before the crest of the flood at Watertown, the water stored in the Stillwater reservoir on the headwaters of the Beaver River represented an average of 4,200 sec.-ft. At the same time the Old Forge and Sixth Lake reservoirs on the Middle Branch of the Moose River were storing water at the rate of 1,300 sec.-ft. and the Black River Canal reservoirs on the extreme headwaters of the Black River were storing an average of 800 sec.-ft. The total runoff withheld from the river was, therefore, approximately 6,300 sec.-ft.

It is improbable that the maximum flows into the reservoirs would have reached the lower river at exactly

the same time had the reservoirs not been in existence, and it is also probable that the combined flood crest would have been reduced somewhat in passing through the flooded valley above Carthage. The foregoing estimates are, however, based on the average inflow into the various reservoirs over a 24-hour period rather than on the maximum runoff in each case.

A study of the characteristics of the tributary streams and the flow of the main river indicates that, without the storage reservoirs, the flow at Watertown would have been increased to at least 40,000 sec.-ft., which is slightly in excess of the "great flood of 1869." The recent flood thus affords another example of the effect of storage reservoirs in reducing the severity of floods. These reservoirs control somewhat less than 15 per cent of the watershed of the Black River and they reduced the flood flow of the lower river by nearly 16 per cent.

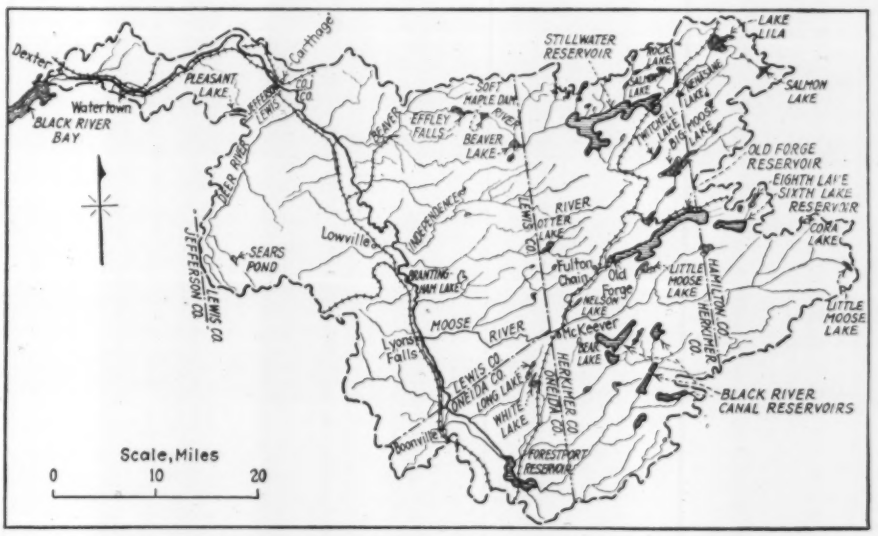
The Stillwater, Old Forge and Sixth Lake reservoirs, having capacities of 4.50, 0.62 and 0.28 billion cubic feet respectively, were built for river regulation—that is, to store flood water and increase the dry-weather flow. The Black River Canal reservoirs include a system of seven small reservoirs, having an aggregate capacity of about 1.7 billion cubic feet, built by the State of New York many years ago to supply water for the operation of the Black River Canal.

At the time of the 1901 flood the Stillwater reservoir (enlarged to its present capacity in 1924) had a capacity of about 0.9 billion cubic feet; the Old Forge and Sixth Lake reservoirs about 0.8 billion cubic feet, while the Black River Canal reservoirs had substantially the same capacities as at present. There is no record of the operation of any of these reservoirs during the flood, and it is, therefore, impossible to determine what effect they may have had in reducing the peak of the flood flow.

In 1869 the only reservoirs in existence were the Black River Canal reservoirs, at North Lake, Woodhull Lake and South Lake, having an aggregate capacity of about 1 billion cubic feet and controlling a total drainage area of 42 square miles. During the flood of 1869, however, the North Lake dam was washed out, due to inadequate spillway capacity, and the contents of the reservoir, about 300 million cubic feet, probably increased somewhat the flood flow on the lower river; at least the destruction of this dam was made the basis for numerous damage claims against the state.

The fall and winter of 1927-28 was unusually wet and groundwater was at a high stage. A heavy accumulation of snow in the Adirondack highlands had hardly begun to melt when the weather turned suddenly warm about April 1 and continued abnormally warm to April 8. The flood was due almost entirely to melting snow; barely ½ in. of rain fell during the eight days prior to the flood. Only about half the snow in the woods, however, was melted during the warm period, which was terminated by a sudden and severe freeze-up. The melting of the snow was completely checked and the accumulated water passed off without great damage. Had the warm weather continued two or three days longer or had there been a moderately heavy rain during the melting period, the flood on the Black River would unquestionally have reached disastrous proportions.

As this flood was unique in that it was due almost entirely to the sudden melting of accumulated snow, the unit runoff from various parts of the Black River watershed may be of interest. At the Watertown gaging station, only 8 miles from the mouth of the river, the drainage area is 1,878 square miles and the unit flow at the peak of the flood was 18 sec.-ft. per square mile. The average flow for the calendar day was about 93 per cent of the peak flow.



BLACK RIVER REGULATING DISTRICT AND LOCATION OF RESERVOIRS

Three gaging stations on the Moose River make it possible to calculate the runoff from the unregulated portion of this watershed with considerable accuracy. The South Branch has a drainage area of about 216 miles of rugged, densely wooded land, lying at an altitude of about 2,000 ft. above sea level with very few lakes, swamps or other retarding basins. The maximum runoff, as indicated by a continuous recording gage, was 47.8 sec.-ft. per square mile.

The watershed of the North Branch (exclusive of the area tributary to the Old Forge and Sixth Lake reservoirs) lies at substantially the same altitude but includes several good-sized lakes and large areas of swamp land. A recording gage shows tht the maximum runoff from 94 square miles was 21.2 sec.-ft. per square mile.

The average runoff from the watershed tributary to the Stillwater reservoir from 8 a.m., April 7, to 8 a.m., April 8, was 26.7 sec.-ft. per square mile, as calculated from the measured outflow and the change in stage of the reservoir, indicated by a float gage reading to hundredths of a foot. This watershed has an area of 178 square miles of rugged, wooded land lying at an average elevation of about 1,900 ft. above sea level.

A recording gage on Otter Creek shows that the maximum runoff from 62 square miles of rather rough, glacial sand plain, lying about 1,600 ft. above sea level, was 34.8 sec.-ft. per square mile.

A staff gage on the Sugar River, read twice daily, showed a maximum of 57.2 sec.-ft. per square mile, and

it is hardly probable that the maximum reading shows the actual maximum flow for the day. The watershed above the gaging station has an area of 42 square miles, lying on the easterly slope of the region known as Tug Hill. It is a steep hillside, partly wooded, underlaid by impervious sedimentary rocks with few deposits of glacial sand and no retarding basins. This is the highest runoff recorded at any of the gaging stations on the Black River watershed during the recent flood.

The plans of the Black River Regulating District, which includes the entire watershed of the Black River, provide for a comprehensive system of reservoirs controlling all the principal tributary streams. These reservoirs will control from 50 to 60 per cent of the drainage area of 1,918 square miles and it is estimated that, after the completion of the system, the greatest floods will be kept well within the safe carrying capacity of the river channel.

Building Design Provides for Expected Settlement

French Railway Station Over Old Mine Workings Will Be Kept at Grade—Reinforced Concrete Sections Used

AMONG the many railroad stations which have been reconstructed in France since the end of the war, the passenger station at Lens deserves special mention because of the known instability of the ground upon which it is erected, the provisions made for expected settlement without damage and the means provided for returning the structure to its established grade at suitable intervals. Due to extensive mine workings below the site, the ground is in an unstable condition—in fact, past records indicate an average settlement since 1870 of approximately 4 in. a year. The design adopted for satisfactory service under these unusual conditions is described in a recent issue of *Le Genie Civil*.

The building itself is a substantial structure of reinforced concrete with the usual features of a main-line passenger station: waiting rooms, baggage rooms, ticket windows, offices for station officials and provisions for telephone and telegraph service. The center waiting room, together with entrance portals, is 55.8x98.6 ft. and there are two wings 27.9 ft. wide and 82.1 ft. and 101.8 ft. long, respectively. Exterior features include extension roofs over the platforms, supports for telephone and telegraph wires and a 75.5-ft. clock tower.

Although apparently a single unit, the building has eleven rectangular sections, each on a foundation of parallel inverted arches which transfer the weight directly to the ground. Any section is free to settle approximately 10 in. without affecting adjacent sections in any way, and conversely any section can be raised within this limit when necessary.

At the four corners of each section space is left for one or more heavy jacks, so that, after a period of settlement, the entire station can be returned to grade, one section at a time.

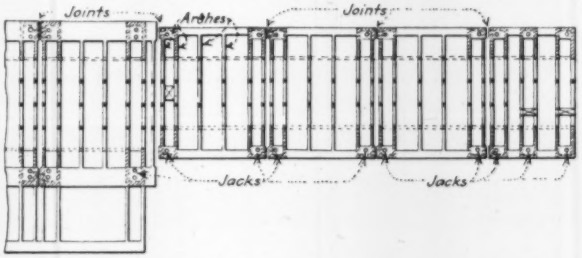


FIG. 2—PARTIAL PLAN, SHOWING FOUNDATION ARCHES, JOINTS BETWEEN SECTIONS, AND POINTS WHERE JACKS WILL BE PLACED

The jacks will be used only long enough to permit filling in under the arches. As soon as this is done the weight will be returned to the usual foundation until raising is again necessary. The sections in the two wings weigh about 160 tons each, so that four 50-ton jacks will provide ample power, including an allowance for breaking the arch loose from the soil. When raising the central sections, which are heavier, it is planned to use eight jacks in all, four of 100-ton and four of 70-ton capacity.

In designing the foundation arches four distinct steps were followed:

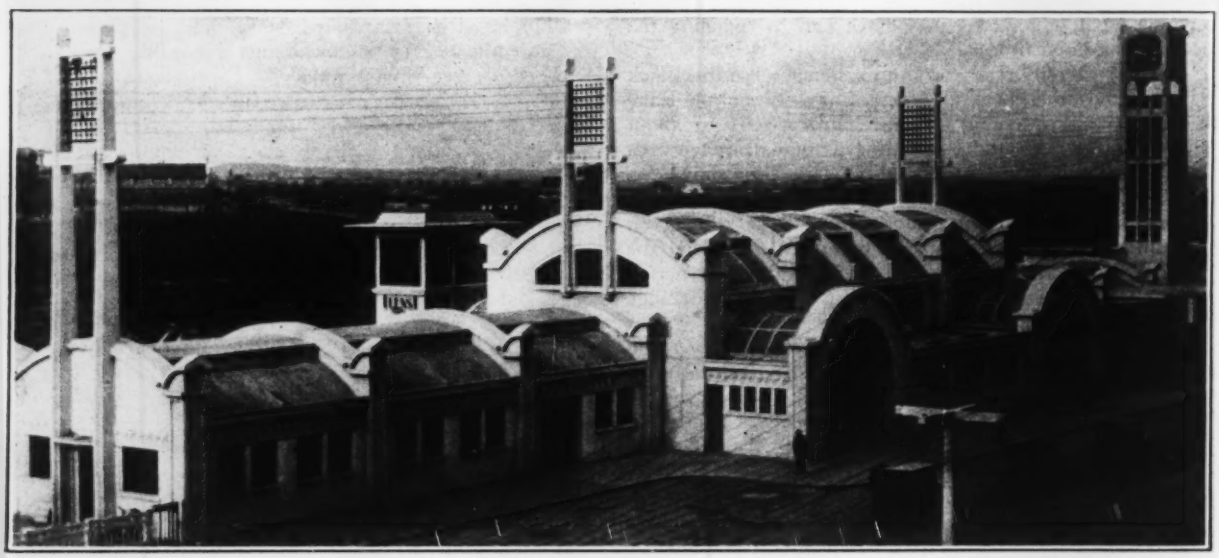


FIG. 1—THE GARE DE LENS, SHOWING SECTIONAL CONSTRUCTION

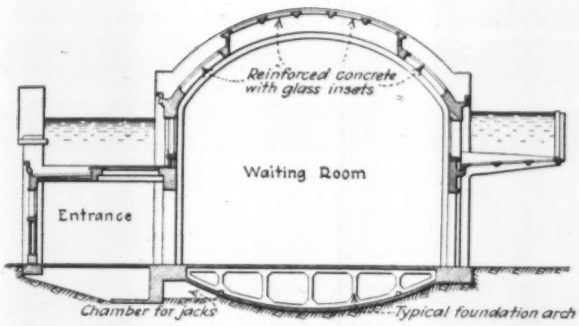


FIG. 3—TRANSVERSE SECTION THROUGH MAIN BUILDING

1. The arch dimensions were proportioned so that the resultant of all permanent loads (both the usual dead load and the weight of permanent fixtures) would pass through the center of the arch. Under these conditions the bearing pressure could be considered as uniformly distributed.

2. The worst possible eccentricity of live load was assumed, and the resultant soil pressure computed.

3. A diagram of the total load imposed on the earth by combining the two preceding factors was constructed.

4. The bending moments and shears produced upon the arch under these conditions were determined.

These conditions apply only where the arches are in contact with the ground and are transmitting to it the entire weight of the building. Consideration was also given to the stresses incident to the jacking operation, at which time all weight will be supported by the jacks, the floor and arch system acting merely as a tie between the walls. The joints between sections are masked by concrete cover-plates designed to permit relative motion between adjacent sections. An interesting feature is the

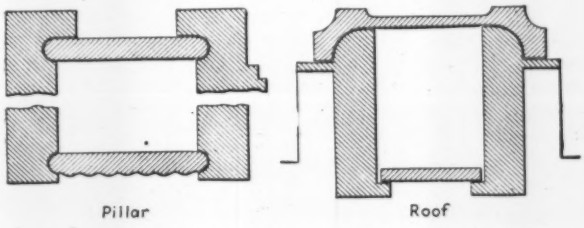


FIG. 4—DETAIL OF JOINTS IN PILLARS AND ROOF

use of over 30,000 circular lights of heavy glass in the roof, which make possible more intensive use of the scanty daylight prevalent in Lens, which is in a northern latitude.

The disposal of rainwater has received special attention because of the expected movement between sections. All rainspouts are led to a collecting pipe along the center line of the building, between the floor and the arches. This pipe is provided with flexible joints between compartments. The same space carries water and heating pipes, and electric conduits.

Power for Pumping on Colorado River Aqueduct

The total horsepower estimated to be required for pumping on the proposed aqueduct that is being planned to bring Colorado River water to Los Angeles is 395,000 hp. and not 278,247 hp., as was inadvertently stated on p. 853 of *Engineering News-Record* for May 31.

Fabricating and Laying New Pipe for Springfield's Water Supply

Six-Mile Supply Line of 48-In. and 54-In. Steel Pipe Has Shop-Welded Seams and Field-Riveted Joints

THE NEW SPRINGFIELD water-supply line is the second large arc-welded steel pipe line, the first being the 65-in. Mokelumne line, 90 miles long, for the East Bay Municipal Utility District in California, completed early in 1927. Shop-welded longitudinal seams on 30-ft. long pipe sections are used in both cases. Butt-welded girth joints were used at first on the Mokelumne line, but were later discontinued for a riveted butt-strap field joint. The Springfield line has used field-riveted girth joints exclusively. —EDITOR.

BETWEEN Provo Mountain Reservoir of the Springfield, Mass., water-supply system and the Connecticut River there is being laid a steel pipe line about 6 miles long. The pipe, in 48-in. and 54-in. diameters, is being laid in 30-ft. lengths shop-fabricated by arc-welding to-

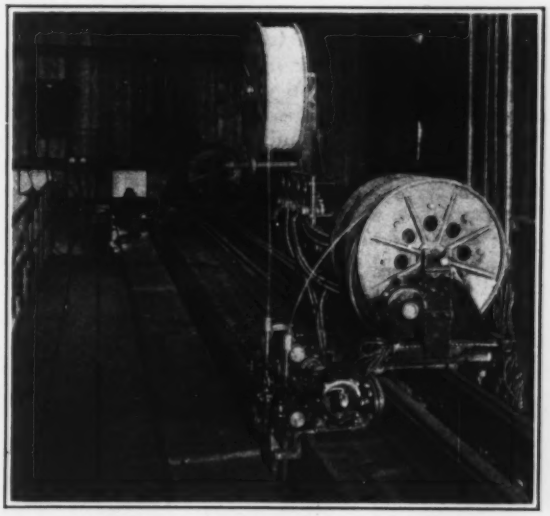


FIG. 1—WELDING HEADS FEEDING WIRE TO PIPE FOR NEW SPRINGFIELD, MASS., WATER LINE

Two heads each carrying two wire electrodes spaced 8 in. apart are used; each electrode deposits about half of the bead. The heads travel in the same direction, one starting at the end of a pipe length and the other at the middle. The speed is about 4½ in. per minute.

gether two semicircular sections of steel plate. The circumferential joints between the sections are riveted in the field. The total weight of pipe for the job is about 4,500 tons.

Fabrication—In the fabricating shop the pipe is completed from flat plate to the finished 30-ft. field lengths. The operations on a steel plate preparatory to the actual welding of the pipe are, in order: laying out and marking; taper-shearing to produce pipe sections with one end slightly larger than the other; beveling the ends so as to facilitate calking; planing the longitudinal edges to produce the required bevels for butt welding (specifications require that the opening for the welding metal in the joints be within limits of $\frac{3}{8}$ and $\frac{7}{16}$ in. at the top); rolling plates into semicircular sections; and tack-welding

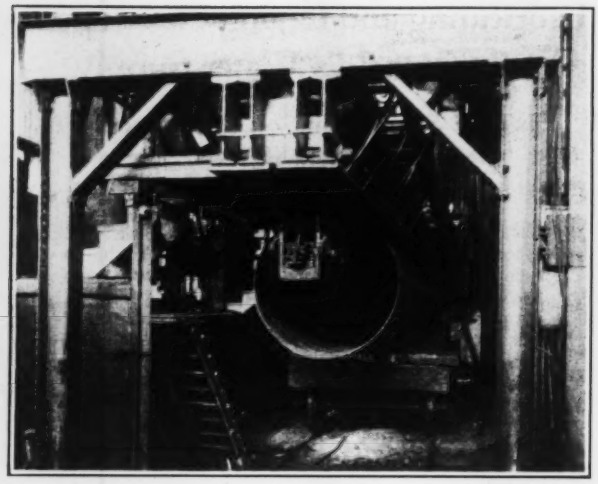


FIG. 2—PIPE SECTION IN PLACE ON BACKING-UP BAR
Welding heads shown in Fig. 1 travel on rails supported by the right-hand I-beam and the inclined bracing bars.

the two half-sections on the inside to hold them during the operation of machine welding the longitudinal seam. The tack welds are ground down smooth in order to leave a uniform surface for the backing-up bar.

After tack-welding, the pipe goes to an automatic arc-welder equipped with two traveling welding heads, each carrying a pair of metal-wire electrodes mounted 8 in. apart. Specifications require that the width of the bead shall not exceed 1 in. or be less than $\frac{5}{8}$ in. and also that the height of a weld be "not less than $\frac{1}{32}$ in. or more than $\frac{1}{8}$ in. above the plate surface."

The pipe is mounted horizontally on a backing-up bar carrying a rounded copper strip 2 in. wide, which is pressed up tight against the under side of the pipe by the bottom of a pneumatic clamp, thus insuring uniform con-

FIG. 3—COMPLETING A PIPE SECTION BY TOUCH-UP WELDING AND GRINDING

tact of pipe and bar. The upper part of the clamp consists of two copper jaws, 2 in. apart, straddling the seam to be welded. A magnetic control circuit in the backing-up bar reduces the magnetic disturbances of the arc during welding.

The welding heads are propelled by a single travel-carriage and move in the same direction along the pipe, one beginning at the end and the other at the middle of

FIG. 4—PREPARING SUBGRADE IN ONE OF THE WET SECTIONS OF THE PIPE LINE

a pipe length. The travel speed is about $4\frac{1}{2}$ in. per minute. The first of the two wire electrodes in each welding head fills up a little less than half the depth of the joint. The second electrode, spaced 8 in. behind the first, completes the weld. With one seam welded, the clamps are released and the pipe is revolved through an angle of 180 deg., preparatory to welding the second seam.

Following completion of the pipe, hand welding is done on any spot that requires touching up and joints are smoothed down by grinders. Each pipe section is required to undergo a hydraulic test of 333 lb. per sq.in. at the shop. The shop fabrication is completed by double dipping in coal-tar pitch varnish at a temperature of about 310 deg. F.

Construction Procedure—The pipe line for most of its length is located in sandy soil containing some clay. The trench, generally 8 to 10 ft. deep, is excavated by a $1\frac{1}{4}$-yd. pull shovel. Distribution of the pipe along the trench is accomplished by a tractor pulling a stone-boat fitted with a cradle for holding one pipe section. A steam crawler-crane swings the pipe section into the trench and assists in accurately placing the pipe preparatory to riveting. In the wet sections of the trench cofferdams of timber sheathing are placed around the joints and pumped out for riveting. Following the riveting of the circumferential joints, the pipe is partly backfilled between the joints to prevent flotation until the line can be tested for leakage at a pressure of 100 lb. per sq.in. above actual service pressure.

Elbert E. Lochridge is chief engineer of the Board of Water Commissioners of Springfield, Mass., and J. B. Porter, assistant chief engineer, is in immediate charge of the work. Daniel O'Connell's Sons, Inc., Holyoke, Mass., the contractor on the work, is having the pipe fabricated at Walsh's Holyoke Steam Boiler Works. The welding machinery was designed by the General Electric Company in co-operation with Vincent P. Marran, general manager Walsh's Holyoke Steam Boiler Works.

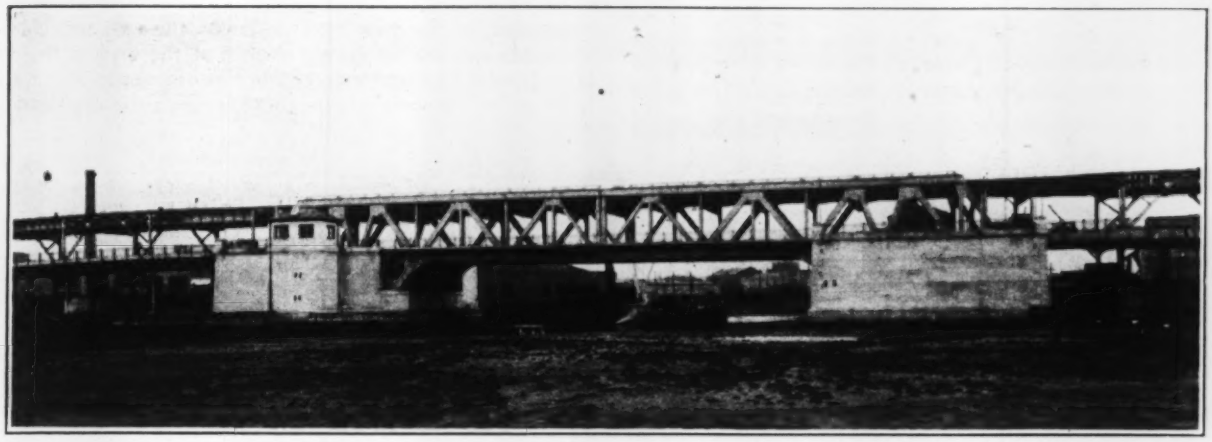


FIG. 1—ROOSEVELT AVE. BRIDGE, FLUSHING CREEK, NEW YORK CITY

Special Track Construction for Large Bascule Bridge

Three Breaks in Each of Three Tracks on Upper Deck of Double-Leaf Bascule Bridge Require Special Construction for Alignment and Expansion of Rails

By Joseph L. Hunt

Assistant Division Engineer, Track Division, Board of Transportation, New York City

AN INTERESTING and somewhat unusual piece of trackwork has recently been completed on the Roosevelt Avenue Bridge over Flushing Creek on the elevated extension of the Queensboro subway to Flushing in the Borough of Queens, New York City. Operation over this extension to Flushing was begun on Jan. 21, 1928.

The bridge, as shown in Figs. 1 and 2, is a double-decked, double-leaf bascule type built to accommodate both highway and rapid transit traffic, the former being on the lower level and the latter on the upper level of the bridge. The distance from center to center of the trunnions of the bridge is 212 ft. and the over-all length of the lift spans is 304 ft. 6 in. The width of the bridge is 47 ft. 4 in. between centers of the outside trusses. It was designed and constructed by the Department of Plant and Structures of the City of New York and paid for jointly out of rapid transit and general city funds, excepting the trackwork, which was designed and installed under the supervision of the Board of Transportation and paid for entirely out of rapid transit funds as a part of the Queensboro rapid transit line to Flushing. As may be seen from the accompanying figures, there are three tracks on the bridge and its approaches, the middle track to be used for express service and the two outer tracks for local service.

As is customary for a bridge of this type, the leaves forming the river span were constructed in an upright position, and likewise the tracks on these leaves were to a large extent placed before the bridge was lowered. Later, when the operating mechanism for raising and lowering the bridge was installed, the tracks were completed in detail, this work being subject to the raising and lowering of the bridge at all times on short notice to permit the passage of vessels.

In general the type of tracks on the bridge is similar to that used on city-built elevated railroads, consisting of 100-lb. ARA-B type rails laid on 8x8-in. ties spaced 18 in. c. to c. with 6x8-in. outside wooden guard timbers and 100-lb. inside emergency steel guard rails. Footwalks constructed of 2x6-in. slatting are laid outside of

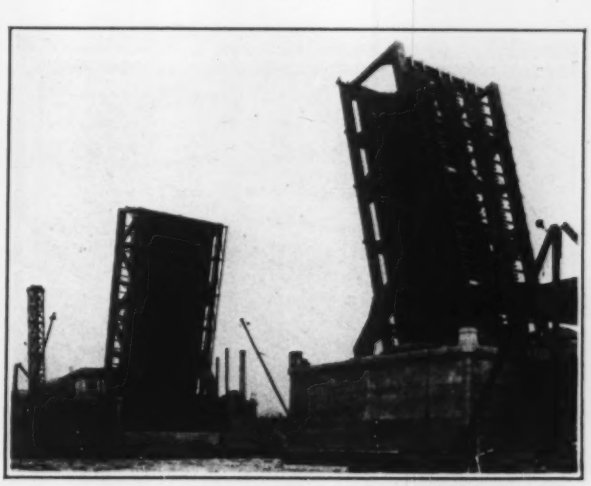


FIG. 2—BRIDGE IN OPEN POSITION DURING CONSTRUCTION

Much of the track was laid on the upper deck while in open position as shown here

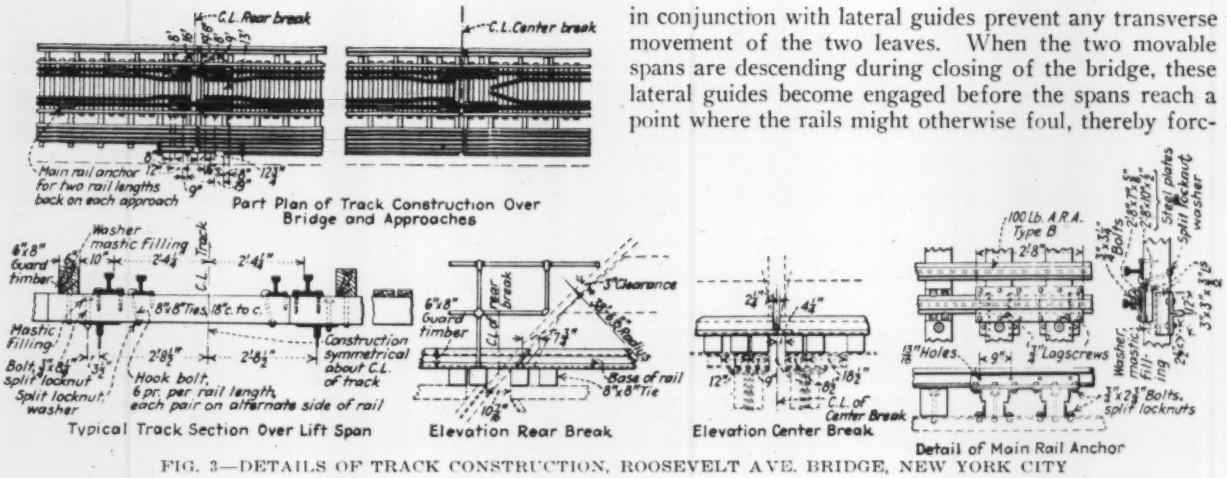


FIG. 3—DETAILS OF TRACK CONSTRUCTION, ROOSEVELT AVE. BRIDGE, NEW YORK CITY

and between the tracks. All parts of the tracks had to be securely fastened to the structure, and special provisions were provided to guard against movement of the tracks. With this object in view, every tie is securely bolted to the flanges of the bridge stringers and special rail anchors are installed at about the center of every length of main rail on the bridge and also for two rail lengths back on each approach. These rail anchors consist essentially of steel angles 2 ft. 8 in. long placed on both sides of the rail and bolted to it by means of 4¾-in. bolts. These angles are shaped to conform to the flange of the rail and are bolted to two transverse 3x3x⅜-in. angles placed adjacent to the tie. At these locations flat plates for the full length of the anchorage are substituted for the regular tie plates. Details of the trackwork and rail anchors are shown in Fig. 3. and a general view of the tracks on the bridge is shown in Fig. 4.

The unusual feature of this trackwork is the special construction of the tracks at the breaks in the structure—namely, at the center and rear of each span due to the operation of the bridge. The two leaves of the bridge when closed are locked together at the center by two electrically operated shear locks which engage the upper chords of the outside trusses. These shear locks in conjunction with lateral guides prevent any transverse movement of the two leaves. When the two movable spans are descending during closing of the bridge, these lateral guides become engaged before the spans reach a point where the rails might otherwise foul, thereby forcing the tracks into proper alignment before the shear lock is seated.

At normal temperature, 60 deg. F., the ends of the track stringers at the center of the span are 8½ in. apart and provision is made in the structure for a reduction of this gap to a minimum of 6½ in. due to temperature changes. There are similar gaps in the track stringers over the two rear breaks. As in the case of all rapid transit tracks, the rails are insulated from the steel structure and from each other.

In order to provide continuous tracks for the safe passage of trains at these gaps in the structure, steel castings of special design were installed in all of the tracks at these three places. Details of these special rail break castings are shown in Figs. 5 and 6, and a general view of the tracks at the center break is shown in Fig. 6. A duplicate set of all parts of the rail break castings is stored on the structure, as shown in Fig. 4, for use in case of emergency. The ends of the castings forming the running surfaces are wedge shaped and lap on a diagonal line to take care of the movement due to expansion and contraction of the bridge, the ends of these castings being directed into place by the guides. Parts of the castings subject to greatest wear are made of manganese steel and other parts are made of carbon steel.

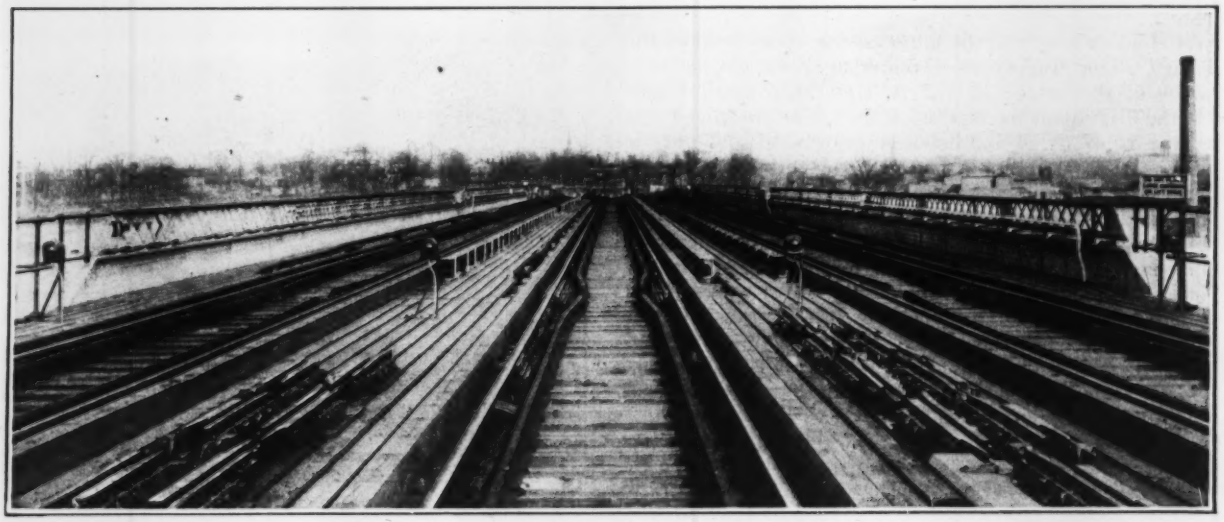


FIG. 4—UPPER DECK, SHOWING TRACKS IN PLACE
Duplicate sets of all special castings are stored on the deck of the bridge for emergency use, as shown in the foreground

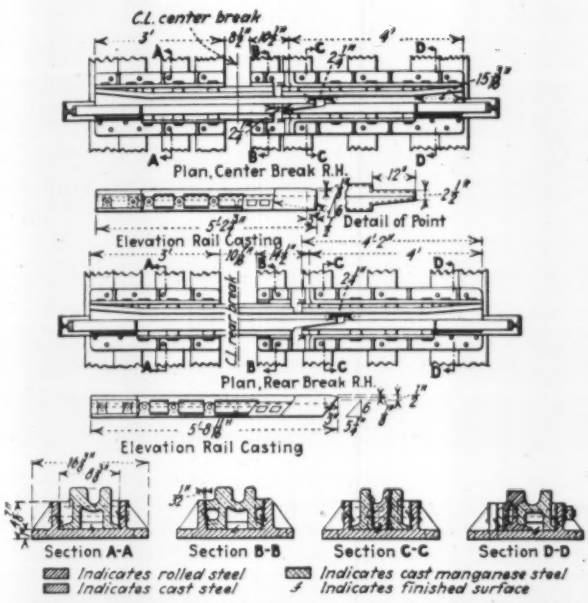


FIG. 5—DETAILS OF SPECIAL RAIL CONSTRUCTION

There is sufficient clearance under the bridge for small boats to pass without opening the draw but it must be opened for all large vessels. The elevation at which the tracks could be carried over the navigable channel in Flushing Creek was limited by the fact that the rapid transit line changes from elevated to subway as soon as it reaches the Flushing side of the creek.

The tracks on the bridge and connecting structure were designed and installed under the supervision of the track division of the Board of Transportation. Robert Ridgway is chief engineer of the board, Robert H. Jacobs

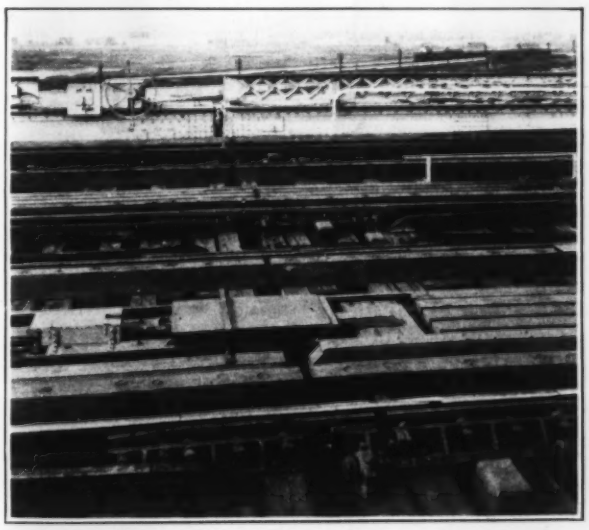


FIG. 6—DETAILS OF TRACK AT CENTER BREAK

division engineer, and James J. McGuire section engineer on the work. The tracks were installed by the Arthur A. Johnson Corporation, for which James D. Kent was the superintendent on the work. A foundation article describing the ingenious method of combining open cofferdam and floating caisson methods on this bridge was published in *Engineering News-Record*, July 14, 1927, p. 48.

Supplementary Outlet Sewer in Essex County, N. J.

By Edward S. Rankin

Secretary, Second River Joint Meeting, Newark, N. J.

A JOINT outlet sewer for seven municipalities in Essex County, N. J., is to be built by what, for short, is known as the "Second River Joint Meeting." The new outlet sewer will be about 4 miles in length, from 24 to 60 in. in diameter, mostly of reinforced concrete pipe, and is estimated to cost $579,250, including an allowance of 25 per cent for unforeseen contingencies. The main line of this sewer parallels Second River in a general westerly direction from its junction with the Passaic Valley trunk sewer which extends from Paterson to New York Bay, nearly to the Glen Ridge line, with three branches to collect sewage from Newark, Montclair and Orange.

The Second River Joint Meeting, was organized for the construction of a supplementary union outlet sewer for certain municipalities in Essex County as follows: Town of Belleville, Town of Bloomfield, City of East Orange, Borough of Glen Ridge, Town of Montclair, City of Newark, and City of Orange. The Joint Meeting was organized on May 21, 1928, under the "Joint Sewer Act of 1899." The organization date was only some one and a half years after the first preliminary meeting. During that time, a preliminary report was made by Alexander Potter, consulting engineer, New York City, and later a final report by Mr. Potter, the latter including plans and estimates, which were submitted in January, 1928. Since the latter date, the seven municipalities have passed necessary ordinances, signed joint contracts, and organized the Joint Meeting so as to carry out the project, with the following officers: Chairman, Charles H. Demarest, Bloomfield; secretary, Edward S. Rankin, Newark; treasurer, William S. Levins, East Orange. Mr. Potter continues as engineer for the project. Mr. Rankin is and for many years has been in charge of the Bureau of Sewers of Newark.

Each of the seven municipalities in the Joint Meeting will own a definite share of the capacity of the sewer and will pay in exact proportion thereto, an arrangement which is said to have given eminent satisfaction as regards the existing joint outlet discharging into Arthur Kill and serving portions of Newark and Elizabeth as well as 6 other communities in Essex and Union Counties.

The existing outlet along Second River was completed some 25 years ago by Orange, Montclair and Bloomfield—the Borough of Glen Ridge having been cut off from the latter in 1895. In 1908, the City of Newark built a small system of sewers discharging into a tributary of Second River and sold rights to Belleville, Bloomfield and East Orange. The completion of the Passaic Valley trunk sewer in 1924 and the fact that the Second River outlet sewer was severely overcharged at some points made necessary the construction of the supplementary sewer undertaken by the recently organized Second River Joint Meeting.

The existing outlet discharged into the Passaic River at North Newark until the Passaic Valley trunk sewer was put in use, but near its lower end there was a storage chamber, designed to hold the sewage for discharge at high tide. The entire flow of the Passaic Valley trunk sewer passes through settling basins before reaching New York Bay.

Engineering Literature

A Monthly Review of Books and a Listing of New Publications

New Text- and Fieldbook on Surveying

SURVEYING THEORY AND PRACTICE—By Raymond E. Davis, M.S., C.E., Professor of Civil Engineering, University of California, and Francis S. Foote, E.M., Professor of Railroad Engineering, University of California, and W. H. Raynor, M.S., C.E., Assistant Professor of Surveying, University of Illinois. New York and London: McGraw-Hill Book Co., Inc. Cloth; 5x8 in.; pp. 1016; 577 linecuts. $5.

By dividing their book into three sections, the authors not only follow a logical sequence for classroom work, but also make the book valuable to the practical man in the field by devoting one portion to problems of interest to him.

Section I, with five chapters serves as an introduction to the entire field of surveying and allied subjects, such as drafting.

Section II, with eleven chapters on the elements of surveying, is the real text of the entire book. All the instruments available for the surveyor are described, as to construction, actual use in the field and limits of accuracy. In this section, as in the other two, much stress is laid upon the probability of error in all kinds of work, considering both the human element and mathematical probabilities. This section describes the different methods of leveling and the plotting of profiles and cross sections. Some attention is given to earthwork calculations and area measurements. The measurement of angles and directions, surveying with the transit and tape and map surveying and plotting are well treated. A long chapter on field astronomy is very appropriate but somewhat unusual in surveying textbooks. This also includes a discussion of time. This section ends with chapters on determination of azimuth, latitude, longitude, and time, and stadia surveying. Improvements in instruments have made this latter method much more accurate than formerly, and the authors are justified in devoting considerable space to it.

The field man is more concerned with section III, which takes up the practice of surveying. The section opens with a discussion on land surveying and the calculation of areas. There is a long chapter on United States public land surveys. Historical notes on land surveys are given in explanation of the present practices. Little attention is given to railroad and highway surveying, these being mentioned under the chapter on route surveying, along with discussions on surveys of irrigation canals, construction work and power transmission lines. Several articles in this chapter, however, are devoted to the geometry and laying out of circular curves with curve formulas and transit set-ups. There is a chapter on mine surveying. Topographic mapping and surveying are considered at length, especially as to the different methods of the latter. That the book is right up to date is evident from the chapters on photographic surveying and aerial photographic surveying. The latter chapter discusses the different cameras used and their operation, the sources of error, and the applications of stereoscopic vision to aerial surveying. Every known method of aerial photographic surveying is taken up and its limits and applications given. Especially well written are the articles on transferring detail data from photographs to the map, and the construction of contour lines on the map. The text ends with a chapter on triangulation. Ordinary precision and high precision methods of triangulation are stated. Considerable space is given to the computations of triangles with many actual problems used.

The book closes with eighteen useful tables containing the usual mathematical tables, and also several astronomical, time, and surveying tables not ordinarily seen, such as convergency of meridians and differences of latitude and longitude.

Standard Book on Water Purification

WATER PURIFICATION—By Joseph W. Ellms, M.Am.Soc.C.E., W.A.W.W.A., M.Am.Chem.Soc., Etc. Second Edition. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6x9 in.; pp. 594; 161 illustrations. $7.

By careful revision and the addition of new material Mr. Ellms' comprehensive book on Water Purification, first published in 1917, has been "brought to date." The new matter adds over a hundred pages to the volume, well distributed from cover to cover. "A new chapter," the Preface states, deals "with the relation of the hydrogen-ion concentration of natural and purified waters to purification processes."

The plan of the book remains as in the first edition (favorably reviewed by Robert Spurr Weston in *Engineering News-Record*, July 19, 1917). After several introductory chapters, including three on sedimentation and coagulation, slow sand and rapid or mechanical filtration are each dealt with at length, the treatment extending to various filter accessories and to power plant and low-service pumps. There is a chapter on capital cost, and another on operating cost and efficiency, of rapid filters. Among the remaining chapters there are two each on disinfection and on the removal of dissolved mineral matter from water—iron, manganese, and salt causing hardness. Appendixes take up some of the hydraulic problems of the subject and present useful tabular matter.

The new chapter on hydrogen-ion concentration is a condensed summary of the knowledge and practice of a highly technical subject. For the benefit of the uninitiated, a simple explanation of the significance of hydrogen-ion concentration in water treatment and of control methods might well have been given.

The book now stands as the only up-to-date exposition of the science and art of water purification. It has the good and the bad features of revised editions generally. That is, the author makes good some of the deficiencies of his first edition but lets much stand that he would not include or would give sometimes more and sometimes less space and emphasis were he not hampered by material already in type. New material, designed to correct the faults just stated, is not always adequate for the purpose and sometimes is not put where it serves to the best advantage, and thus may be overlooked or undervalued by any but the most thorough and reflective reader. Thus, the original data on typhoid fever, some of which were recent and adequate, and some already getting old, in the first edition, appear to stand entirely unchanged, and although supplemented, further on, by more recent figures, are

likely to make impressions not eradicated by the later data, although they might have been, at least in part, had a few sentences been inserted emphasizing the changed conditions of recent years. Much the same is true of some of the cost data, although these are not so misleading in themselves, while warnings as to changes in the value of the dollar are given and in some cases the figures are recast accordingly. As already indicated, these are faults or problems incident to revised editions generally. They have been met with more than average success in this book which bids fair to continue for years as the standard work on water purification.

British and American City Government

THE MODERN DEVELOPMENT OF CITY GOVERNMENT in the United Kingdom and the United States—By Ernest S. Griffith, D.Phil. (Oxon.); Warden, University Settlement, Liverpool; Hon. Lecturer, Liverpool University; Sometime Preceptor in Economics, Princeton University. In two volumes: Vol. I and Vol. II. New York: Oxford University Press, American Branch; London: Oxford University Press—Humphrey Milford, publisher to the University. Cloth; 6x9 in.; Vol. I, pp. 422, Vol. II, pp. 323. $14.

So comprehensive a comparative study of British and American city government as this has never before been attempted. The work has been well done. It should appeal to all who are interested in municipal government.

The first volume is historical, outlining the development of municipal government, first in the United Kingdom, then in the United States, before 1870; 1870 to 1900; 1900 to 1924. Comparisons between the two countries are continued in the second volume, but under these heads: Legal Basis, Functions, Framework, Finance; Relations of Central and City Government; Public Opinion; Systems of Government. Of 25 appendixes, mention may be made of an extensive classified bibliography a summary of the growth of committees of the city councils of Liverpool, Leeds, Birmingham and Bristol (in Birmingham the committees and sub-committees increased from 30 in 1870 to 126 in 1922); and a variety of other statistics, some affording comparisons between cities of the two countries.

Fundamental differences in British and American municipal government today, according to the author's summing up, lie in the ruling class, the land and local taxation systems, and Parliamentary and bureau control in England, and in the American assumption of equal ability of all to rule, which has fostered education at public expense, in a flexible system of taxation here and, in some parts of America, in a wide measure of home rule. Respect of the ruling class in Great Britain, Mr. Griffith holds, has begot and maintained a respect for law beyond that prevailing in America. His strongest pleas for change in England are directed towards the adoption of a system of land taxation for purposes of local government, in order to lessen "ratepayers resistance" to measures that will raise their "rates" (i. e., local taxes, based on the rental value of houses and other real property). Objections to increased "rates" retard municipal improvements and services, foster Parliamentary and central administrative control of local affairs, and as a palliative to both, lead to ever increasing "subventions," or "grants in aid" to the local governments from the national treasury. As these "grants in aid" increase, so does the dictation of central government as to how the money shall be spent; and correspondingly, lack of local interest in town government decreases. All this, the author holds up as a warning to have a care as to extensions of central aid to local government—which he realizes is relatively small here, as yet.

Olmsted, Senior, and Central Park

FREDERICK LAW OLMSTED: LANDSCAPE ARCHITECT, 1822-1903—Edited by Frederick Law Olmsted, Jr., and Theodora Kimball. Vol. II. Central Park as a Work of Art and as a Great Municipal Enterprise, 1853-1895. [Forty Years of Landscape Architecture, Being the Professional Papers of Frederick Law Olmsted, Senior.] New York and London: G. P. Putnam's Sons. Cloth; 6x9 in.; pp. 575; 30 illustrations. $7.50.

First in narrative then in documentary form this handsome volume tells the story of Central Park. The volume being a part of an extended account of the professional life and work of F. L. Olmsted, Sr., the story is confined mostly to the forty years during which Olmsted was regularly or occasionally connected with the park, ending in the 1890's.

The story is one of trials, tribulations and triumphs, the latter being in the minority, and relating chiefly to winning the competition, with Vaux, for a plan for the park, and to an occasional brief period of relatively satisfactory working conditions. Most of the time Olmstead had to combat politics, the spoils system, ignorance of park matters on the part of the park board, public indifference to the needs of the park and wanton damage by the public, besides endless attempts to pervert the park from the uses to which it was dedicated. Again and again he resigned. A reading of this story helps understand the debilitated condition of Central Park in recent years.

Besides being a valuable contribution to the history of parks, landscape architecture and outdoor recreation in America, the volume is valuable as forming a part of the life and activities of one of the great American pioneers in landscape architecture and city planning. It throws sidelights on municipal administration and on public interest and indifference to a great municipal enterprise; an indifference all the more remarkable because the park was designed, and through its endless vicissitudes has been maintained, for the benefit of the masses; and an interest notable because it has been the devoted work of a few which has, in some measure, made and saved the park for the many.

Publications Received

RECENT DAM FAILURES and considerable discussion regarding state control of the design, construction and maintenance of these structures make timely a reprinting of laws and rules relating to public water supplies and the erection of dams, in New Jersey, compiled by the Department of Conservation and Development, Division of Water, State of New Jersey (Trenton.)

THE TENTH VOLUME of the Journal of the American Association for Promoting Hygiene in Public Baths (Proceedings for 1927) contains much information on public baths and swimming pools in the United States and elsewhere, including the final report of the Joint Committee on Bathing Places of the Conference of State Sanitary Engineers and the Public Health Engineering Section of the American Public Health Association. (50c. from Arthur M. Crane, treasurer, 327 West 25th St., Chicago, Ill.)

GARBAGE COLLECTION AND DISPOSAL methods in about 75 cities are tabulated in the 1928 annual report of the International Association of Street Sanitation Officials (secretary, A. M. Anderson, 10 South La Salle St., Chicago). With this is a tabulation of incineration and reduction practice at 30 cities. Other papers, supplemented by extended discussions as to individual practice and experience, cover problems of snow removal, weed cutting, rubbish and ash disposal, street repairs and cleaning, utility excavations, manhole cleaning, street signs, parking, the budget system and the training of employees.

ENGINEERING BULLETIN No. 3, Maryland State Department of Health, contains 15 papers on various sanitary engineering subjects, some of which make up the Proceedings of the First Annual Conference of the Maryland Water and Sewage Plant

Operators. Two of the papers deal with sanitary control of oyster production, one of these being by Abel Wolman, chief engineer, Maryland State Board of Health. Another paper by Mr. Wolman is addressed to the question, How much water does a consumer require? The other papers take up various aspects of water and sewage treatment.

THE SPEED TRAFFIC CONTROL PROBLEM of the City of Boston is the subject of a quarto volume report of 435 p., prepared under the direction of the Mayor's Street Traffic Advisory Board by Miller McClintock, director, the Albert Russel Erskine Bureau of Traffic Research, Harvard University. Besides a detailed study of the Boston traffic problem, the report contains a proposed traffic code for Boston, covering some 30 printed pages. The other three main divisions of the report deal with the Boston traffic problem, relief through traffic control methods and through administration. Mr. McClintock has conducted similar surveys for Los Angeles, Chicago, San Francisco and other cities.

SEWAGE CHLORINATION with special relation to control of odors from raw sewage is dealt with in a 28-p. pamphlet, being Engineering Bulletin No. 19 of the University of Kansas (Lawrence, Kan.). Odor control was studied at Independence, Neodesha and Emporia, Kansas, by James L. Barron and R. E. Lawrence, assistant engineers, State Board of Health. At Neodesha and Independence odors in the raw sewage have been so bad that it "has been necessary to bypass sprinkler filters entirely during the summer months." Among the conclusions of the report are: "Chlorine destroys H_2S in definite proportions and kills hydrogen sulfide producing organisms, thus serving to inhibit an odor nuisance. Definite odor reduction can be obtained by maintaining residual chlorine in the tank influent, but an excess is not necessary in the effluent."

New Books and Revised Editions

[*Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.*]

APPRENTICESHIP IN BUILDING CONSTRUCTION—By Estelle M. Stewart, U. S. Department of Labor. Paper; 6x9 in.; pp. 133. 20c. from Superintendent of Documents, Washington, D. C.

AUSTRALIAN YEAR BOOK, 1927—Melbourne: Bureau of Census and Statistics. Boards; pp. 1037; tables and illustrations. For free distribution.

AUTOMOBILE INDUSTRY, Facts and Figures, 1928 Edition. New York: National Automobile Chamber of Commerce, 366 Madison Ave. Paper; 6x9 in.; pp. 96; illustrated.

BONDED DEBT OF 213 CITIES, Jan. 1, 1928—By C. E. Rightor, Chief Accountant, Detroit Bureau of Governmental Research. Reprinted from *National Municipal Review*, June, 1928. Paper; 6x9 in.; pp. 12, mostly tables.
Figures reduced to a comparative basis. This annual survey includes, for the first time, special-assessment-for-benefit debts.

CHAINS, Causes of Failure of Wrought Iron—By H. J. Gough, M.B.E., and A. J. Murphy, M.Sc. London: H. M. Stationery Office. New York: British Library of Information, 44 Whitehall St. Paper; 7x10 in.; pp. 167; illustrated. 7½s.

ELECTRICITY IN GREAT BRITAIN: A Study in Administration—By Orren C. Hornell, Bowdoin College. Supplement to *National Municipal Review*, June, 1928. (261 Broadway, New York City).

EMBRITTLEMENT OF BOILER PLATE—By Samuel W. Parr, Professor of Applied Chemistry, Emeritus, and Frederick G. Straub, Special Research Assistant in Chemical Engineering. Urbana, Ill.: Engineering Experiment Station. Paper; 6x9 in.; pp. 71; illustrated.

ESTIMATING BUILDING COSTS: A Concise and Handy Guide for Contractors, Building Tradesmen, Material Men, Technical Students and All Others Interested in the Construction of Dwellings, Barns, Stores and Industrial Buildings of Moderate Cost—By William Arthur, Author of "New Building Estimators' Handbook"; "Appraisers' and Adjusters' Handbook"; "The Home Builders' Guide." Third edition, revised and enlarged. New York: Scientific Book Corporation. Semi-flexible; 5x7 in.; pp. 233; tables and illustrations. $2.
In this edition, the Preface states, "many changes have been made and much new matter has been added." The book has chapters on excavation and piling, concrete, brickwork, stonework, plastering, woodwork and the other materials and operations essential to building construction. It is designed for use on smaller buildings than those dealt with in the author's New Building Estimators' Handbook, now in its 14th edition.

FOREST AND STREAM-FLOW EXPERIMENT at Wagon Wheel Gap, Colo.: Final Report, On Completion of the Second Phase of the Experiment—By C. G. Bates, Silviculturalist, Forest Service, and A. J. Henry, Meteorologist, Weather Bureau. Sup. No. 30, *Monthly Weather Review*. Paper; 10x12 in.; illustrated. 25c. from Superintendent of Documents, Washington, D. C.

FLAT PLATES, Strength and Stresses—By T. A. Bryson, T. Cheeger and H. H. Gorrie. [Theses of advanced students, edited by E. A. Fessenden, Professor of Mechanical Engineering.] Troy, N. Y.: Rensselaer Polytechnic Institute. Paper; 6x9 in.; pp. 59; illustrated. 50c.

GAS INDUSTRY, Present and Future, and Relation of the Engineer to Its Progress—By Walter C. Beckford, Vice-President and Engineer, American Light & Traction Co., New York City. [Lectures on Engineering Practice.] Paper; 6x9 in.; pp. 33. Baltimore, Md.: School of Engineering, Johns Hopkins University.

HIGHWAY SUBSOIL INVESTIGATIONS IN OHIO, Preliminary Report—By F. H. Eno, Research Professor of Highway Engineering. Columbus: Ohio State University. Paper; 6x9 in.; pp. 59; illustrated.

IRRIGATION IN MADRAS PRESIDENCY: Administrative Report, 1926-27. Madras: Public Works Department. Paper; 6x9 in.; pp. 444. Rs. 2-6-0.

IRRIGATION OF COTTON—By James C. Marr and Robert G. Hemphill, Associate Irrigation Engineer, Division of Agricultural Engineering, U. S. Bureau of Public Roads. Paper; 6x9 in.; pp. 37; illustrated. 10c. from Superintendent of Public Documents, Washington, D. C.

PORT OF HAMBURG—By Dr.-Ing. L. Wedenmuth, Oberaudirektor, Wasserbaudirektion, Hamburg, and Dipl. Ing. W. Böttcher, Baurat, Kaiverwaltung, Hamburg. Translated from the German by Wilhelm Eggers. Issued by the Deputation fur Handel, Shiffahrt und Gewerbe and the Baudeputation, Sektion fur Stromund Hafenbau, Hamburg, Germany. Cloth; 7x9 in.; pp. 230; 83 pp. of advertising; many halftones, a few colored map, one folding.
History, description and statistics of this noted German port.

ROAD MATERIALS IN ARKANSAS—By W. R. Spencer, Professor of Civil Engineering. Fayetteville, Ark.: Engineering Experiment Station. Paper; 6x9 in.; pp. 82; much tabular matter.

ROAD SCHOOL, Proceedings of Fourteenth Annual, at Purdue University, Lafayette, Ind. Editor, Ben. H. Petty, Assistant Professor of Highway Engineering. Paper; 6x9 in.; pp. 124.

ROLLER BEARINGS: Elimination of Waste, Simplified Practice, U. S. Department of Commerce. Paper; 6x9 in.; pp. 12. 5c. from Superintendent of Documents, Washington, D. C.

SEWAGE TREATMENT, Ohio Conference, 1927—Columbus, Ohio: State Department of Health. Paper; 6x9 in.; pp. 29.
Contains Ohio Sewer Rental Law, notes on its operation and some municipal ordinances putting it in effect; also a descriptive table of sewage-works in Ohio, and other material.

SHORT SCHOOL, Texas Association of Sanitarians, 1927—Austin, Texas: Texas Association of Sanitarians, State House. Paper; 6x9 in.; pp. 136.

SOIL CORROSION STUDIES, Bureau of Standards: I. Soils, Materials, and Results of Early Observations—By K. H. Logan, Electrical Engineer, S. P. Ewing, Junior Physicist, and C. D. Yeomans, Junior Scientific Aids. Paper; 7x10 in.; pp. 108; half tones, line cuts and tables. 50c. from Superintendent of Documents, Washington, D. C.

SPONTANEOUS COMBUSTION IN STORAGE COAL—By A. J. Hoskin, Research Associate. Lafayette, Ind.: Engineering Experiment Station. Paper; 6x9 in.; pp. 61, including Bibliography.

STANDARDS YEAR BOOK, 1928—Compiled by National Bureau of Standards. Cloth; 6x9 in.; pp. 399. $1 from Superintendent of Documents, Washington, D. C.
Outlines standardization activities of bureau named above and of states, counties, municipalities, technical societies and trade associations in America and also similar work abroad. Contains bibliography.

STRENGTH OF MATERIALS: A Text Book for Secondary Technical Schools—By Mansfield Merriman, Late Member of International Association for Testing Materials. Revised by Thaddeus Merriman, M.Am.Soc.C.E. Seventh Edition, Revised and Reset. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 5x7 in.; pp. 204; 60 line cuts. $1.75.
New articles on Portland cement and concrete and other amplifications by the reviser have increased the number of pages from 169 to 204. All the problems have been recast and 148 new ones added, bringing the total up to 378. The volume has gone through nearly thirty editions and reprintings since its original appearance in 1897.

TESTS ON THE HYDRAULICS AND PNEUMATICS OF HOUSE PLUMBING, Part II—By Harold E. Babbitt, Professor of Sanitary Engineering. Urbana, Ill. Engineering Experiment Station. Paper; 6x9 in.; pp. 62; illustrated.
Takes up trap seals, loss of pressure of faucets, mixing values of shower baths, and plumbing system of a tall building.

TEXAS WATER WORKS SHORT SCHOOL: Proceedings, 1928. Paper; 6x9 in.; pp. 294; illustrated. Address Dr. J. C. Anderson, State Health Officer, Austin, Texas. $1.

TRAFFIC ORDINANCE, Tentative Draft of Model Municipal—Issued in tentative form, for criticism, by Committee on Municipal Traffic Ordinances and Regulation, National Conference on Street and Highway Safety, Department of Commerce, Washington, D. C. Paper; 6x9 in.; pp. 84. Free on request.

ZONING, WHAT IS COMPREHENSIVE? By Harland Bartholomew, President, American City Planning Institute, St. Louis, Mo. Paper; 6x9 in.; pp. 27.

News of the Week

Syracuse to Eliminate Crossings

A petition submitted to the New York State Public Service Commission requests the elimination of all main-line grade crossings in Syracuse in accordance with a comprehensive plan prepared by Fay, Spofford & Thorndike, of Boston, and approved by the voters last fall. At present there are 136 grade crossings within the city limits and approximately 8 miles of city streets are used for railroad right-of-way, some for main-line passenger traffic. Recent traffic counts showed that 165,000 vehicles crossed 44 of the most important crossings daily.

The plan submitted will, at a cost of approximately $20,000,000, remove from the streets all traffic of the New York Central system with the exception of a certain amount of freight shifting necessary to serve the 163 private industrial sidings of the city. Passenger trains of the New York Central and West Shore railroads will operate on an elevated track along the present West Shore right-of-way. A new passenger station, the location of which is still unsettled, will be constructed to serve both roads. Relocation of present freight yards will make it possible to remove most of the tracks from the streets, and limitation of traffic on the remainder to times when street traffic is light is expected to reduce the accident toll to a negligible amount. Through freight will be routed around the city, as at present.

The plan also provides for crossing elimination on the Chenango Valley branch of the New York Central, and on the Rome, Watertown & Ogdensburg Railroad.

Stop Subway Plan for Chicago

The latest move towards providing Chicago with a rapid-transit subway was the action of the city council on July 11 in appropriating $648,000 for the preparation of plans for a project to be worked out by the board of public improvements. But this action was promptly checked by the discovery that the council had no authority to make this appropriation and that the proposition must go to public vote or referendum. Under this latest plan it was proposed to try and finance the project by special assessment of property benefited, and all work financed in this way comes under the charge of the board, independently of the department of public works. Many plans and projects for a subway have been prepared by engineers for the city or for outside interests during the past twenty years, but none of these have got beyond the paper stage.

Report of Board of Investigation on the Greenville Earth Dam

Failure Laid to Break in Outlet Pipe —Recommends Removal of Pipe and Repair of Dam

On July 9 the board of engineers appointed by the Water Commission of Greenville, S. C., to investigate the partial washout of the Table Rock Cove dam of the city's water supply system on May 4, rendered a report which attributes the washout to a break in the reservoir drain pipe passing through the base of the dam. The report was rendered by W. S. Lee, of Charlotte, N. C., J. E. Sirrine, of Greenville, and J. L. Ludlow, of Winston-Salem, N. C., though the report lacks the signature of Colonel Ludlow, who was the engineer in charge of design and construction of the dam for the city. The report recommends that the dam be repaired, that hillside seepage be provided for, and that the drain outlet pipe be abandoned.

The report is reproduced below, as it appears in the Greenville *News* of July 10.

"In accordance with your instructions, we have carefully looked over plans and data furnished us and made physical examination, of the Table Rock dam forming part of your new and comprehensive water works system. We have been accorded any information we wished by the Greenville Water Works Commission, Department Heads and Assistants. We have also been accorded every service asked for by Col. J. L. Ludlow, your consulting engineer.

LOCATION

"This impounding dam is located on the South Saluda River just below Table Rock. It is a wonderful site for a water works development and impounds a beautiful stream in a suitable section for a water supply, in fact, the location and conception of the scheme have been well done.

GENERAL DESCRIPTION OF DAM

"This dam is built by what is known as the layer, sprinkle or roll type of dam. In other words, the selected earth material has been placed in thin layers, sprinkled with water, and rolled so as to compact same. This is a standard type of construction and is recognized as a proper method of building such structure. The dam spans the gorge and is about 750 feet long and it has a width across the top of 30 feet and has comparatively flat sides slope down each side. It has a maximum height of 140 feet and the width of dam at its highest point across the bottom is approximately 700 feet. For handling the water in the dam three outlets are provided consisting of:

"First, a concrete spillway which is lower than the earth dam and permits any excessive or extra flood water to pass harmlessly by the dam. Its location is such as not to interfere with the operation of the water supply intake or endanger the dam itself.

"Second, an inlet tower with control valves connecting with the gravity water main extending to the city of Greenville. The bottom of the pipe intake is 29.5 feet below the spillway level and immediately below the dam the pipe is provided with

(Continued on p. 111)

Pasadena Gets Permit for San Gabriel Dam

The California Division of Water Rights has granted the city of Pasadena permit for a storage dam on the San Gabriel River at the Pine Canyon site, which is 6 miles below the Forks dam site, of the Los Angeles County Flood Control District. Pasadena filed claims to the Pine Canyon site in 1923, planning to store flood waters that would otherwise waste into the sea. The granting of this permit follows five years of study by the state at a cost of $105,000.

The permit gives the city the right to divert not more than 40,000 acre-ft. in any one season and not more than 150,000 acre-ft. in a 5-year period. Plans call for a dam about 300 ft. high which will flood the valley for a distance of three miles and will store 65,000 acre-ft. Part of this capacity is to be used for cyclic storage in the years when the entire 40,000 acre-ft. allotment is not consumed. A bond issue, probably for $8,000,000, to provide funds for financing the Pine Canyon project is to be put before the voters in November. Speed in construction will be a factor because the city's present supply is already taxed to capacity in dry seasons and about three years will be required to bring in the new supply.

Stratton Member of Naval Board

Samuel W. Stratton, president of the Massachusetts Institute of Technology and former director of the Bureau of Standards, has been appointed to the special board selected by the Navy Department to consider ideas for submarine safety and salvage submitted as a result of the S-4 disaster. This appointment completes the board, the other members of which are: Joseph Strauss, D. W. Taylor, W. R. Whitney, and Thomas A. Scott. Full details of the work to be done were given in *Engineering News-Record*, July 12, 1928, page 74.

Philadelphia Recinds Bar Against Foreign Cements

The storm of protest aroused by the recent action of the Philadelphia City Council in passing a resolution requiring the use of "Portland cement of American manufacture" in all municipal work, resulted in the speedy repeal of the ruling. Protests were presented by the Belgian and British Consuls, by Philadelphia exporters who feared retaliatory measures, and by the City Solicitor, who declared the action of the Council illegal. The awarding of several contracts of city work was held up pending the final decision on the matter.

Chicago Engineering Societies Will Cooperate

Periodical suggestions for consolidation of the various engineering societies and branches in Chicago, in order to reduce the duplication of effort and energy, led to the appointment of a committee representing the five principal organizations to consider the practicability of such a scheme. This committee has now reported that consolidation is impracticable and may not be necessary for the desired purpose, but that a permanent committee representative of the societies concerned should be created to act as a clearing house for matters of joint interest and to study methods of securing closer co-operation. Each representative should be the president or chairman of his organization, with an alternate designated from its executive committee in order to insure full representation at meetings. The joint committee which made this report was headed by Rufus W. Putnam, president of the Western Society of Engineers, with A. J. Hammond, Harold V. Coes, M. M. Fowler and Wm. R. Wright representing the local branches of the national societies of civil, mechanical, electrical and mining engineers, respectively.

Power Project on St. Lawrence Approved by Canada

Permission to divert 40,000 sec.-ft. of water from the St. Lawrence River between Lake St. Francis and Lake St. Louis has been granted by the Canadian Government to the Beauhornois Light, Heat and Power Company. The power, none of which may be exported to the United States, will be utilized in the vicinity of Montreal. The terms of the agreement call for the development of 100,000 hp. within five years and 500,000 hp. within ten years at a yearly rental of $20,000 for five years and $50,000 thereafter.

California Association Aims at Registration of Engineers

The "California Engineers' Registration Association" has been formed to introduce at the 1929 session of the legislature in that state a bill that will require the examination and registration of professional engineers. The association is expected to "speak for the whole profession in California" and to avoid necessity for having the movement sponsored by any single group or engineering society. Much of the background for the organization comes from the fact that an engineers' registration bill passed both houses of the 1925 legislature but failed to receive executive approval. Circular matter sent out by the association lists nine reasons for the registration of engineers, which are condensed in the following:

1. It gives to the profession and its membershrip a legal status, something which does not exist at present.

2. In time it will raise the standard of the profession.

3. It will provide a means of eliminating from the profession the unfit, uneducated, incompetent, etc.

4. It will help to better conditions in the profession.

5. It is inevitable, as evidenced by the increasing number of states that adopt it each year.

6. It will prevent the dumping of undesirables into this state as registration crowds them out of other states.

7. No state which has adopted such a law desires to repeal it but, on the other hand, there is a tendency to strengthen its provisions.

8. The protection of the general public under modern conditions requires that some public authority certify to the qualifications of practicing engineers.

9. Qualified engineers deserve protection from the competition of incompetents who foist themselves upon the public.

Free St. Paul Water Department from Political Control

Under O. W. Rohland, the new commissioner of public utilities at St. Paul, Minn., the civil-service eligibility requirements for the position of superintendent of the water department are to be restored, these requirements having been modified by a former commissioner in February to permit the position to be held by C. L. May, formerly a transitman in the department of public works. The controversy following the appointment of Mr. May to succeed John W. Kelsey, when the latter was made city engineer, was noted in *Engineering News-Record* of Oct. 20, and Dec. 8, 1927, pp. 651 and 935.

American Wins British Medal

George L. Watson, consulting engineer of the Holland Tunnels since 1920, has received notification that the Telford Gold Medal of the Institution of Civil Engineers has been awarded him for a paper on "The Design and Construction of the Sewage-Treatment Works of the City of Trenton, New Jersey, U.S.A." The formal presentation of the medal will take place at a meeting of the society next November. The Telford Medal has been awarded previously to only two Americans, William J. Wilgus and J. Vipond Davies.

Building Code of Philadelphia Being Revised

A committee of the Philadelphia, Pa., city council has resumed work on the revision of the building code of that city after several months of inactivity due to lack of funds. It is expected that a tentative code will be presented to the council in September, at which time public hearings will be held before final action is taken. Although no official statements have been issued, it is expected that the new code will allow an increase in the design strength of structural steel in line with sentiment in other large cities of the country.

Charles Macdonald, Pioneer Bridge Builder, Dies

Charles Macdonald, civil engineer, builder of bridges in many parts of the world, and one of the organizers of the American Bridge Company, died on July 8 at his home at Gananoque, Ont., at the age of 91. After graduating from Queen's University, Kingston, Ont., and Rensselaer Polytechnic Institute he entered the service of the Grand Trunk Railway in 1857, serving on construction work in Michigan. In 1863 he was placed in charge of surveys and construction for the Philadelphia and Reading, and served for a time with the Pennsylvania Volunteers, being captured by the Confederates at Gettysburg. In 1868 Mr. Macdonald moved to New York City, and for many years thereafter was engaged in bridge engineering. He was one of the organizers of the Union Bridge Company, which built, among others, the Hawkesbury River Bridge in New South Wales, the Hudson River Bridge at Poughkeepsie, the Leavenworth Bridge at Kansas City, and the Merchants' Bridge at St. Louis. When the Union Bridge Company became part of the American Bridge Company Mr. Macdonald became a vice-president of that organization. He retired from active work a short time later, but continued a consulting practice on a number of structures, notably the Quebec Bridge.

In 1908 Mr. Macdonald was elected president of the American Society of Civil Engineers. He was also a member of the Engineering Institute of Canada, the Institute of Mining Engineers, and a trustee of both Rensselaer Polytechnic Institute and Stevens Institute at Hoboken, N. J.

State Toll Bridge Law Upheld

A law empowering the State Highway Commission to issue bonds for the erection of toll bridges, recently passed by the General Assembly of Kentucky, was upheld by a decision of the Court of Appeals in a suit brought by a taxpayer, who charged that the law was unconstitutional as it allowed the commission to spend money in excess of its current revenues; that it was special legislation; that it attempted to delegate legislative powers to the commission; and that property could be condemned without due compensation. All these contentions were dismissed. Flem D. Sampson, Governor of Kentucky, has stated that approval of the law will mean an expenditure of over $30,000,000 on bridges throughout the state during the remaining six months of 1928.

Enforcing Toll Bridge Contract Proves Troublesome

The Oklahoma Highway Commission is experiencing some difficulty in recapturing a toll bridge over the South Canadian River near Eufaula. The contract between the state and the bridge company was made with the understanding that the bridge was to be turned over to the state when construction costs, interest and other costs were paid in tolls. Recently the bridge company refused permission for the State Highway Commission's auditor to make an audit, but, according to W. C. Burnham, state bridge engineer, the bridge company has now agreed to permit an auditor appointed from the Attorney General's office to go over its books and make a report as to the actual condition of its finances.

The bridge under discussion was built in 1917 at a cost of about $167,000. The contract between the state and the bridge company was entered into in 1923 so that federal aid could be obtained in building the Jefferson Highway through the county. It was proposed to use the tolls then charged on the bridge to pay the bridge company 6 per cent on the agreed price of the bridge, $194,000, plus operating expenses. The tolls collected on the bridge have jumped from $12,000 to about $80,000 a year and, according to the figures of the State Highway Commission, the obligation should be discharged some time this year.

The difficulty in enforcing the contract rests on several factors. There are minor questions of what items are to be included and what salaries are to be allowed. The main difficulty is a question about taxes since the State Equalization Board, which assesses public utilities, held that the bridge was state property, while the federal government taxed the excess profit on the structure as though it were a private concern. The counties on each side of the bridge then assessed taxes back to 1923 against the structure, and in all tax charges of $30,000 to $40,000 have piled up. The highway commission believes that the difficulties will be settled some time this summer.

(Continued from p. 109)

a branch suitable for discharging excess water into the river if it is desired.

"Third, a 42-inch inside diameter extra heavy cast iron pipe under the dam at its lowest place, which outlet was used for handling the riverflow during the construction of the dam. This 42-inch pipe is of very heavy type and is designed to withstand an hydraulic head of 400 feet while the lowest point of the pipe is only 128 feet below the spillway level of the reservoir.

"The dam was started in late summer of 1925 and was completed about September, 1927. From all evidence of the section of the dam the materials of which it consists are well suited for this type of structure and good judgment was used in building the dam.

ACCIDENT AND DAMAGE TO EARTH DAM

"During the month of April, 1928, there appeared slight signs of seepage near the hillside on the Pickens side of the dam. This seepage when properly handled occurs very often after the water is impounded above the dam and is due to the geology of some of the hillsides not consisting of materials as impervious to water as the materials of which the dam is constructed. This seepage, when properly handled and taken care of, offers no danger to the structure. About two weeks after the appearance of this seepage the 42-inch pipe extending through the bottom of the dam burst or broke about 140 or 150 feet above the downstream toe of the dam. The reservoir at that time being about 100 feet higher than the elevation of the pipe, where it broke and immediately discharging through the break in the 42-inch cast iron pipe quite a volume of water. This water washed away the downstream section of the dam around the break in the pipe line and also caused additional earth to slide in, which was all washed down the river. The washing away of this material as not affected by the pressure of the water from the reservoir and the fact that this dam with the amount of material washed away by the break in the 42-inch pipe line still held the impounded water in the reservoir shows conclusively to us that you have a very safe structure there.

FINDINGS

"1. The damage to the dam was caused by a rupture in the 42-inch pipe line at a point 140 to 150 feet above the downstream toe of the dam. This failure washed out a large amount of earth in and around it and caused slides above it from the Pickens side.

"2. This type of dam is entirely safe and when proper repairs are made can be relied on as a permanent and safe structure. The fact that after the pipe line failed that it still retained over 100 feet of water impounded in the reservoir without any signs of distress confirms this.

RECOMMENDATIONS

"We recommend:

"1. That the dam be restored practically on the original lines with only such changes in slopes as are necessary to use the material most economically.

"2. That adequate provision be made for the care of seepage from the hillside as is necessary under present conditions.

"3. That a 42-inch pipe line which caused the disaster be done away with as this line is no longer necessary.

"4. As the dam can be repaired promptly at a reasonable cost and made absolutely safe, we recommend that you at once to repair same and put the plant back into commission.

"Respectfully submitted,"
(*Signed*)
W. S. LEE,
J. E. SIRRINE,
"Consulting Engineers."

Will Develop St. Maurice River

The Shawinigan Power Company has leased from the Province of Quebec the right to develop power from a series of rapids on the St. Maurice River. Allard Falls and Des Coeurs Falls are also included. The company will pay a yearly rental of $25,005 and, in addition, a royalty of $1 per developed horsepower. The agreement provides that the company must start construction not later than July 1, 1930, must develop at least 300,000 hp. and must spend at least $25,000,000 on development work. No power may be exported to the United States.

The lease is the result of an auction sale by the government, at which the Shawinigan Power Company was the sole bidder.

Contract Let for Kill van Kull Bridge Abutments

The Port of New York Authority has awarded the contract for abutments on the new arch bridge between Bayonne, N. J., and Port Richmond, S. I., to H. P. Converse, of Boston, Mass., for $515,709. A list of the bidders, and a brief description of the contract appeared in *Engineering News-Record*, July 12, 1928, page 74. Bids for the steel work on the bridge will be received in the early fall.

Reclamation Agreement Signed

By an agreement made July 6 at Washington, a 20-year-old controversy is ended, and the reclamation of Paradise Valley in Arizona is made possible. The agreement is between the Salt River Valley Water Users Association, the Verde River Irrigation and Power District, and the United States Government. It regulates the distribution of the waters of the Verde River, a torrental stream which flows into the Salt River some distance above Phoenix, Arizona. Heretofore the reclamation of Paradise Valley was prevented by claims of prior right on the part of the Salt River project, near Phoenix. The waters of the Verde River were first used in the vicinity of Phoenix, but this district now has its main water supply from Roosevelt reservoir, on Salt River, built by the government. Under the document signed today it is agreed that the flow of the Verde River that is necessary to supply the water to which Salt River Valley is entitled, shall be maintained. The Paradise Valley interests, however, may dam and use for irrigating their own land all additional water flowing in excess of the amount to which the Salt River Valley is entitled. Although the present contract does not provide for the actual development of the area, it opens the way for future construction by settling the controversy.

Railroad Executive Dies

Howard Elliott, chairman of the board of the Northern Pacific Railroad, and former president of that road and of the New York, New Haven and Hartford, died July 8, at Dennis, Mass.

Starting as a rodman with the Burlington System shortly after his graduation from Harvard, Mr. Elliott rose steadily until, in 23 years, he was vice-president in charge of maintenance, operation and construction of the Burlington System. In 1903 he was made president of the Northern Pacific, and ten years later of the New York, New Haven and Hartford. A large part of the credit for the re-establishment of that road in public confidence is due to Mr. Elliott. His intensive work resulted in a nervous breakdown in 1907, so that he resigned his position as president, but continued as a director of the road. In 1920 he was made chairman of the board of the Northern Pacific. At the time of his death Mr. Elliott was also director of a number of other enterprises, among these being the Burlington, Colorado & Southern Railroad, the New York Connecting Railway, the New York and Stamford Railroad, the New York, Ontario and Western Railroad, the Rutland Railroad, the Westchester Street Railway Company and the New England Steamship Company. He was a member of the American Society of Civil Engineers and the American Railway Engineering Association. He was also a life member of the Corporation of the Massachusetts Institute of Technology.

Am.Soc.C.E. Board of Direction Meets in Buffalo

Nineteen members of the Board of Direction of the American Society of Civil Engineers met at the Hotel Statler, Buffalo, on July 16 and 17, immediately preceding the convention of the Society in that city

Following adoption of a report from a committee which has been investigating the organization and activities of American Engineering Council the board voted to refer to the membership of the society the matter of affiliating with that body. The committee report favored affiliation

The Committee on Technical Expansion, appointed in January to study and report on the organization and conduct of the technical activities of the society, submitted a preliminary report and was continued. This report outlined a proposed proceedure for carrying on the technical work of the society which contemplates the strengthening of the technical divisions as the agency for initiating and developing the bulk of the society's technical activities. It outlined also a proposed classification of the society publications and defined the type of material to which each should be devoted. The committee recommended also that the monthly business meetings of the society in New York City be discontinued except for those in March and October, and this recommendation was made the subject of an amendment to the bylaws which will be acted upon at the October meeting of the board.

Future meetings of the society were fixed as follows: October, 1928, San Diego, Calif.; April, 1929, Dallas, Texas; Convention 1929, Milwaukee, Wis.; Fall 1929, Boston, Mass. Tentative dates were set as follows: Spring 1930, Sacramento, Calif.; Convention 1930, Toronto, Ont.; Fall 1930, St. Louis, Mo.; Spring 1931, Miami, Fla.; Convention 1931, Rochester, N. Y.; Fall 1931, French Lick, Ind.

The president of the Society was authorized to confer with the President of the United States, to bring to his attention the unsatisfactory progress in the topographic mapping of the country by the U. S. Geological Survey and the Coast and Geodetic Survey and to recommend a more rapid completion of the mapping projects.

The board authorized the formation of a Mid-South Section at Memphis, Tenn., in response to a petition from 58 members and approved a proposed constitution for the section. Approval was given to an amendment to the constitution of the Power Division discontinuing the division dues.

Col. Lincoln Bush, president of the society was appointed to the John Fritz Medal Board of Award, to replace vice past-president C. E. Grunsky, whose term will expire in October next.

The board acted upon 220 applications for membership.

The president and the secretary of the society were authorized to address a letter to Secretary of Commerce Herbert Hoover, Hon. Mem. Am. Soc. C. E., congratulating him on his nomination for the presidency of the United States.

The Special Committee on the Mississippi Flood Control Problem was discharged with the thanks of the board.

WASHINGTON NOTES

By Paul Wooton
Washington Correspondent

Boulder Dam Commission to Meet—Navigation and Power Have Liaison Officer—Highway Activities

WHILE no definite announcement had been made at the time of this writing, it is expected that a meeting of the Colorado River Commission will be called in Washington in the near future to organize the study and to determine whether or not existing records contain the fundamental engineering data needed. As the commission has to report in December, it is evident that no large amount of new field work can be done. It is expected that the commission will find that existing data are sufficient on which to base the studies of the problems involved at the Boulder site, but there is doubt of the adequacy of the information concerning dam sites in connection with alternative projects. For that reason, it may be that some boring and some surveys may have to be done.

It is recognized that two of the important problems which the commission must undertake are concerned with the feasibility of accomplishing the construction work necessary under the physical difficulties encountered in the canyon in the short working season available, and with the checking of the cost estimates. Most of the information essential to those studies is available, although it is practically certain that the commission will want to look over the site and possibly gather a small amount of supplemental data. It is known, however, that arrangements are being made in Washington for clerical help and office facilities.

Co-operation in River Control

Maj. Glenn E. Edgerton, chief engineer of the Federal Power Commission, has been made a member of the Board of Engineers for Rivers and Harbors. He will fill that place in addition to his other duties. This is a step looking to the co-ordination of navigation and power development so that the possibilities of power development may be considered in connection with navigation improvements and likewise so that the issuance of federal rights for water power development may fit into plans for river work.

Kansas Calls Special Session

A special session of the Kansas Legislature is to open July 19 so that the state's constitution and its laws may be made to conform with the requirements of the federal government in the matter of co-operative construction of highways. Kansas is the last state in the Union to put its highway operations on a state, rather than a county, basis. Before calling the special session, the Governor exacted pledges from the membership which insures a limitation of five days for the session and the consideration of no business other than the legislation necessary to bring the state's practice within the requirements of the highway act.

The fact that this action has been put off thus long will mean a delay of from six to nine months in putting under contract the $2,100,000 of federal aid which was authorized at the last session of Congress.

Highway Officials to Meet

As an introductory to the consideration of sound policies to govern increased highway expenditures by states, the American Association of State Highway officials is attempting to secure as one of the features of the program at its annual meeting, to be held in the Stevens Hotel at Chicago November 12-15, an outstanding figure in the financial world as one of its speakers. He will be asked to discuss the extent to which a state may properly go in highway expenditures and the best means for financing road improvements that are paid for entirely by the state and its subdivisions. Last year the states expended $625,000,000 for construction alone. Due to the fact that improved highways have greatly reduced the cost of local haulage, the demand for more improved roads in rural sections is becoming more and more marked. It is that situation which the state highway officials desire to be in a position to meet.

Naval Construction Activities

The Bureau of Yards and Docks of the Navy Department is constructing at Yorktown, Va., a new type of magazine for the storage of high explosives. The outstanding feature of the design is that the magazines will be sunk in the earth and bulkwarked at the ends so that in case of accident, the explosive force will be directed upward instead of horizontally.

The magazines, some of which are already completed, are semi-cylindrical structures of reinforced concrete, covered with earth except at the ends which are protected by barricades of earth faced with creosoted wood. Each magazine is 40 ft. long and 10 ft. high at the crown of the arch. The approximate capacity of each magazine is 140,000 pounds of explosives. The magazines are located in groups of seven with a spacing of 500 ft. between the units in each group and 1,900 ft. between groups. The design was developed by Capt. E. R. Gayler (C.E.C.) U.S.N. under Rear Admiral L. E. Gregory (C.E.C.) U.S.N. Chief of the Bureau of Yards and Docks.

Bids will be opened on August 8 on

the two 6,500,000 cubic foot dirigibles authorized by Congress, according to announcements at the Navy Department. It is felt by Naval officers that inasmuch as the present hangar at Lakehurst, N. J., will not be able to accommodate both of these proposed aircraft and the Los Angeles, provision must be made for a new hangar in the near future.

Brief News

THE STEEL FRAMEWORK of the new fifty-six story Chanin Building at Forty-second Street and Lexington Avenue, New York City, has been completed. A total of 27,000,000 lb. of steel has been erected in 104 working days. The building will have a total height of 680 ft.

PHILADELPHIA'S LARGEST OFFICE STRUCTURE, the Fidelity-Philadelphia Trust Building, which has been under construction for the past year, has been completed. It is thirty stories high and rises 377 ft. above the sidewalk. There are three basements. The floor space is 618,000 sq.ft., the cubical contents 11,500,000 cu.ft.

COLORADO IS PLANNING to issue $60,000,000 in bonds, the proceeds to be used for paving highways throughout the state. The bond issue will be submitted to the voters at the November election and if approved, the gasoline tax will be raised from its present three cent rate to about five cents, in order to provide for the additional bond issue.

CONSTRUCTION OF SUBMERGED DAMS in the St. Lawrence River below Montreal will increase the levels of the river during the dry season, thus greatly facilitating navigation. Work on several dams is expected to start in the near future, as a sum of $1,000,000 was voted by the last session of Parliament for this purpose.

CONTRACTS FOR RAILWAY EXTENSIONS in the Peace River country of northwestern Canada, authorized by the government of Alberta, from Whitelaw to Waterhole and from Wembley to Hythe have been awarded to Roosa, Wilkstrand & Brooks, of Edmonton, Alta. Work on the 15-mile extension of the Central Canada Railway from Whitelaw is being proceeded with immediately and the contractors expect to have the work completed by Nov. 1.

ALTHOUGH SNOW WAS CLEARED AWAY from the Fall River road near Estes Park in Colorado, by June 13, a few days later one of the heaviest falls for many years made it necessary to use snow plows to remove over 50,000 cu.ft. before the road could be reopened. The altitude of the road is 11,789 feet above sea level.

CONSTRUCTION OF A NEW BRIDGE across the Missouri River at St. Joseph, Mo., has been approved by the Department of War. The application was made by the city of St. Joseph.

Engineering Societies

CALENDAR

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS; Annual Convention, Buffalo, N. Y., July 18-20.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston, Mass.; Annual Convention, Montreal, Canada, Sept. 18-21.

AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS, St. Louis, Mo.; Annual Convention, Detroit, Mich., Oct. 22-25.

THE AMERICAN INSTITUTE OF QUANTITY SURVEYORS held its third annual convention at the Pennsylvania Hotel, New York City. Among the speakers were John G. Ahlers, of Barney Ahlers Company, New York City. The following officers were elected: President, Oscar Euphrat, Cincinnati, Ohio; vice-presidents, Frederick H. Hunter, of Boston, Mass., and C. L. Weeks, of Los Angeles, Cal.; secretary, F. E. Dischner, Detroit, Mich.; and treasurer, C. T. Burman, of Chicago, Ill.

THE NEW YORK STATE ASSOCIATION OF CITY ENGINEERS held an annual conference at Troy, N. Y., July 6. At the conference a legislative committee was organized, consisting of William T. Field, Watertown, chairman; James Brennan, Geneva; and Charles H. Wenz, Rensselaer.

THE NORTHEASTERN SECTION, AM. SOC. C. E., has elected Karl R. Kennison president to fill the unexpired term of the late Sturgis H. Thorndike.

THE ENGINEERS' CLUB OF ST. LOUIS will give a farewell dinner to Brig.-Gen. Charles L. Potter on July 23, on the occasion of his retirement from active service.

Personal Notes

Col. E. LESTER JONES, director of the U. S. Coast and Geodetic Survey, and member of the International Boundary Commission, is attending the International Geographic Congress in London as a delegate from the National Research Council. Colonel Jones will present a number of papers discussing geographic boundaries, the importance of coastal surveys, and geodetic survey methods in North America.

JOHN LYLE HARRINGTON, ERNEST E. HOWARD and LOUIS R. ASH announce the dissolution of the consulting firm of Harrington, Howard & Ash, consulting engineers, with offices in Kansas City, Mo. Mr. Harrington will be joined by Frank M. Cortelyou in the firm of Harrington & Cortelyou, which will carry on a general engineering practice concerned principally with bridges, dams and similar structures. Mr. Howard and Mr. Ash will be joined by Henry C. Tammen and E. R. Needles in the firm of Ash-Howard-Needles & Tammen to carry on a gengineering practice similar to that of the old firm, concerned principally with bridges and structures. Both firms will have offices in Kansas City and New York.

O. F. OHLSON, formerly superintendent of the Lake Superior division of the Northern Pacific Railway, has been appointed General Manager of the Alaska Railroad. The appointment will become effective about August 1. Mr. Ohlson succeeds Noel W. Smith, whose services were loaned to the Alaskan Railroad by the Pennsylvania Railroad in 1924.

I. PAUL JONES, formerly secretary of the Delaware State Highway Department and treasurer of the American Association of State Highway Officials, has joined the engineering forces of the burerau of valuation of the Interstate Commerce Commission, and has been assigned to work in northeastern territory.

L. J. SVERDRUP, formerly chief bridge engineer of the Missouri State Highway Department, and John I. Parcel, professor of structural engineering at the University of Minnesota, have formed the engineering firm of Sverdrup & Parcel, with offices in St. Louis. The new firm will specialize in bridges, buildings, and foundations.

PAUL B. WOLF, who has been connected with the bureau of highways, Baltimore, since the bureau was organized, has been appointed assistant highways engineer. Nathan L. Smith is highways engineer.

WILLIAM S. MORTON, formerly with the engineering department of the Pennsylvania Railroad, is now engineer and superintendent for the Interstate Dredging Company, with headquarters in Chicago.

OBITUARY

Brig.-Gen. E. EVELETH WINSLOW, U. S. Army, retired, died at his home in Raleigh, Tenn., on June 28. He was 62 years of age. General Winslow graduated from West Point at the head of the class of 1889, and had a long and varied career with the Army. He was connected with river and harbor and fortification work at various times at Mobile, Ala., Wilmington, N. C., Norfolk, Va., and Honolulu, T. H. General Winslow was designing engineer on the fortification of the Canal Zone, and a member of the advisory board on the fortification of Chesapeake Bay and Guantanamo Bay, Cuba. In 1914 he was made assistant to the Chief of Engineers. He also served as a member of the board of engineers on river and harbor works for a number of years and, while an instructor at West Point, aided in the design and construction of the waterworks there.

Construction Equipment and Materials

Highway Equipment Builders Elect New Officers

At a recent meeting of the directors of the old Highway Industries Association, now known as the "Manufacturers Division" of the American Road Builders' Association, M. A. O'Mara, president, Brockway Motor Truck Corporation, was elected director to fill the vacancy caused by the resignation of S. M. Williams. Willard T. Chevalier, general manager, *Engineering News-Record*, was elected director to fill the vacancy caused by the death of R. W. Hume. Frank A. Peck, vice-president, Universal Crane Company, was elected secretary.

At this meeting the plan for bringing about an affiliation between the Highway Industries Association and the American Road Builders' Association was consummated. The directors were authorized to take the necessary steps at the annual meeting in January. The change has been made without effecting the organization and functioning of the Highway Industries Association as a unit but it now becomes an integral part of the American Road Builders' Association and known as the "Manufacturers Division." The president of the Highway Industries Association becomes one of the vice-presidents at large of the American Road Builders' Association. C. M. Upham, secretary-directory of the American Road Builders' Association was elected executive secretary of the Highway Industries Association.

Provision was made in the by-laws of the Highway Industries Association whereby associate directors could be elected representing non-exhibiting associations or industries, where the cooperation of such interests would be beneficial. Under this provision S. M. Williams, manager of the Engineering & Construction Division, of the Associated General Contractors was elected associate director of the Highway Industries Association.

Manufacturers' and Distributors' Day at Road Show

An important innovation at the 1929 Road Show in Cleveland, Ohio, has been announced in the form of a manufacturers' and distributors' day, Saturday, January 12, preceding the formal opening of the show on Monday, January 14. It is planned that all exhibits be in place Saturday morning, according to the Manufacturers' Division of the American Road Builders' Association.

It is felt that the inauguration of this plan will offer an opportunity for contacts between the manufacturers and their distributors at a time when both are relieved of the pressure of taking care of customers. There is planned a joint program in which is included the subject of false credit, long terms, etc., which is at present being discussed at joint meetings between various manufacturers and representatives of the Associated General Contractors. Standardization will also be a subject under discussion.

Concrete Road Yardage

There is given below a tabulation of concrete pavement yardage awarded during June together with the total number of square yards awarded for the year up to June 30, 1928, as prepared by the Portland Cement Association. The figures represent awards in the United States only.

	Sq. Yd. Awarded During June, 1928	Sq. Yd. Awarded from January 1, 1928 to June 30, 1928
Roads	8,996,588	53,428,816
Streets	5,875,515	24,516,668
Alleys	574,006	1,790,133
Totals	15,446,109	79,735,617

Business Notes

Union Iron Works, Hoboken N. J., announces the appointment of G. S. Green Co., New York City, as its sales agent for the New York metropolitan area, including southern Connecticut and northern New Jersey.

National Paving Brick Manufacturers Association announces the appointment of Quincy A. Campbell as acting secretary and assistant to the managing director. Mr. Campbell has resigned the position as assistant chief engineer of maintenance, Ohio State Highway Department, to enter his new position.

Universal Portland Cement Co., Chicago, announces that F. L. Stone has been appointed general sales manager, succeeding Blaine S. Smith who recently resigned to become president of the Pennsylvania-Dixie Cement Corporation. Mr. Stone started as a salesman with the Universal company 18 years ago and has been successively chief clerk, assistant sales agent, division sales manager, and assistant general sales manager.

W. S. Dickey Clay Mfg. Co., Kansas City, Mo., announces that it has moved its southeastern sales office to the Candler Building, Atlanta, Ga., where the sales work heretofore handled at Chattanooga and Macon will be concentrated. The office personnel includes Clif. B. Beasley, southeastern sales manager, recently at Birmingham; Arthur G. Brading, formerly at Chattanooga; Henry C. Davis, from Macon, and others coming to Atlanta from various southern offices of the company. The sales office and plant at Birmingham will continue to serve the same territory as formerly. J. C. Buchanan, recently at the Chattanooga office, succeeds Clif. B. Beasley as sales manager at Birmingham.

David Lupton's Sons Company, Philadelphia, announces that it will immediately erect the first unit of its new Chicago manufacturing plant and warehouse. This will be 500 ft. long by 150 ft. wide, located upon a tract of 93,881 sq.ft. The ultimate plant provides a building 1,000 ft. long by 300 ft. wide.

Pittsburgh Testing Laboratory, Pittsburgh, Pa., announces the opening of an office in Boston at 101 Tremont Street, in charge of Donald L. Macdonald, who was formerly connected with the engineering department of Stone & Webster.

T. L. Smith Co., Milwaukee, announces the appointment of the Newlin Motor Co., Kansas City, Mo., as distributors for the western half of Missouri and the eastern half of Kansas. This company will handle the company's construction mixers, while the pavers will be handled as previously by the Bublitz Machinery Co.

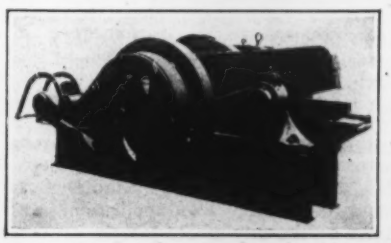
Anderson Engine & Foundry Company, Anderson, Ind., announces the opening of a new office in the Exchange Building, Memphis, Tenn., which will include a complete sales and service branch.

Davis Northern Glass, purchasing agent for Booth & Flinn, Limited, contractors, New York City, died suddenly at Battle Creek, Mich. Mr. Glass had been associated with Booth & Flinn, Limited, since 1888 and had an extensive acquaintance among contractors and manufacturers.

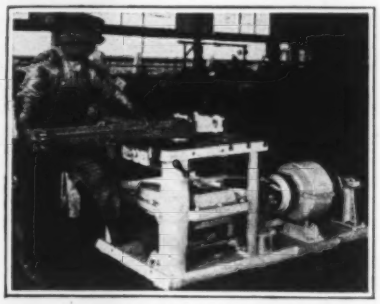
New Developments

Machinery for Fabricating Reinforcing Steel

Improvements and new designs have been incorporated in the various machines for fabricating reinforcing steel manufactured by the Alamo Iron Works, San Antonio, Tex. There are here illustrated and described a shear, a rotary bender and a combination rotary bender and bulldozer.



The alligator shear is especially designed for use in concrete bar warehouses or scrap yards. Semi-steel castings, forged-steel crank and pin shafts and a reversible steel cutter-blade easily detached for sharpening are features of



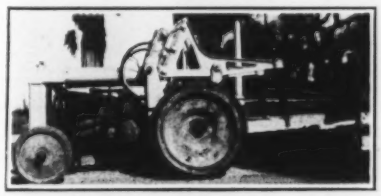
the machine. The steel beam sub-base permits installation without an expensive foundation. Although the machine can be furnished with direct-gear drive, the manufacturers recommend an 8-in. belt with an individual motor. The capacity with a blade 14¾ in. long is ¾x4 in. flat mild steel, ½x12 in. mild steel plate and 1¼ in. round or square mild steel bars. A 7½-hp. motor is required.

The rotary bender shown in the second illustration may be either belt or motor driven. The machine is adaptable to bending stirrups, stays, beam or slab bars, continuous column hooping and all circular or angular bending, including pipe, bolts, etc. With a simple system of dies and gages, exact duplicates of any bends may be made without the necessity of making each bar separately. In the illustration the operator is shown making a 90-deg. bend. Attachment can be supplied for bending rods to large radii and for coiling wire spirals. The capacity of the bender is one 1¼-in. to 1½-in. bars; two ⅞- to 1⅛-in. bars; three ¾-in. bars; four ⅝-in. bars; six ½-in. bars; and eight ⅜-in. bars.

The combination rotary bender and bulldozer is designed particularly for the reinforcing steel used in girders, beams or slabs. The bulldozer is of the double-ram type and will handle any angular bend of 70 deg. or less. The double-ram feature permits making all bends in the bar without losing time in turning it end for end. The two rams are hinged to a traveling head and either of them can be placed in position while the other is in a non-operating position, or both may be used at the same time. On the same base with the bulldozer is an ordinary rotary bender. The general specifications of each machine are the same except that with this unit the company uses a combination belt and motor drive, the belt being connected from the motor to the heavy flywheel operating the bulldozer. The same motor is also directly connected to the gearing that operates the rotary bender. In the illustration the operators are shown completing the second angle and finishing drop as the bars pass through the bulldozer. The capacity of the machine in bending girder bars is one 1¼- to 1½-in. bars; two ⅞-in. to 1⅛-in. bars; three to six ¾-in. and smaller bars. For bending slab bars making two bends at one time up to a 10-in. drop, two ⅞-in. bars; three ¾-in. bars; and four to six ⅝-in. and smaller bars can be fabricated.

Grader Attachment for Tractors

A new pull-type road grader for attachment to any standard tractor, to operate under direct control of the tractor driver has been introduced by the

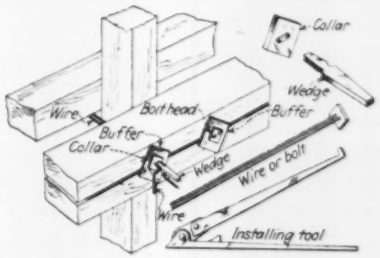


K-M Grader Patrol Company, Joplin, Mo. Simple in design and detachable in ten minutes, the grader has the following advantages: Wheels on either side of the tractor driver to control the vertical adjustment of the blade are the only operating devices necessary; it is drawn without additional wheels or track and does not alter the tractor in any way; compression springs give the blade the predetermined pressure; when passing over uneven surfaces the blade may be kept in constant contact with the ground by means of a spring and hinge device; the scraper blade is manually operated both longitudinally and laterally without a fixed center point; the blade is mounted upon a frame 6 ft. long and 2½ ft. wide and may be adjusted to an angle of 55 deg., operating on a sliding shoe along the frame. The blade may be reversed for bulldozing and when backfilling ditches.

Concrete Form Ties Fastened by Ingenious Wedge

A new type of form clamp or tie has been placed on the market by the Wedgit Tie Co., Inc., 95 Liberty St., New York City. As shown in the accompanying illustration, the tie is similar to a bolt, although it has two stems of extra strong wire. One end of the wires is upset in order to hold the head of the bolt. On the other end, instead of a thread and nut an ingenious wedge is used to fasten the "bolt." A collar is slipped over the end of the two wires and a wedge driven between the wires and into an elongated hole in the collar, the while a tightening tool or mule holds the wires in tension. The tightening tool weighs 2 lb. and has a leverage of 30:1.

A feature of this form clamp is that it cannot be locked except when pulled rigidly tight. It is claimed that an average workman develops a strain of about one ton in the wires by the time



he is ready to drive the locking wedge. The lower handle of the tightening tool holds the collar down, while the ratchet handle draws the wires tight. A hard-rolled steel buffer, about 2¼ in. square and ⅛ in. thick, is used between the head and the collar of the tie to take care of the recoil from the impact caused by the pouring of the concrete. The manufacturers stated that if it is desirable to remove the rods, the tightening tool will pull them as easily as it tightens them. This new tie is also recommended by its manufacturers for use in all complicated form construction where braces are usually necessary. It is claimed that the use of these ties, because of the permanent rigidity they afford the forms, eliminates to a great extent the necessity for bracing.

At the present time the wedgits are made in four sizes as follows: 40 in., which provides for 36 in. outside to outside of walers; 48 in. for 44-in. walers; 64 in. for 60-in. walers, and 90 in. for 86-in. walers. They are packed in crates containing 100 each.

Manufacturers and Trade Associations

CALENDAR

ANNUAL MEETINGS

TRACK SUPPLY ASSOCIATION, Chicago; annual exhibition and convention, Detroit, Sept. 18-20, 1928.

CONCRETE REINFORCING STEEL INSTITUTE, Chicago; semi-annual meeting, Buckwood Inn, Shawnee-on-Delaware, Pa., October 1-3, 1928.

New Publications

Buckets—ERIE STEEL CONSTRUCTION COMPANY, Erie, Pa., has issued a folder in which are bound specification sheets for its standard clamshell buckets, for its special-digger clamshell buckets, and for its scraper clamshell buckets.

The Business Side of Construction

Materials Imports Come In at Eight American Seaports

Effect Local—Steel Warehouse Men Hit Hardest—How Materials Are Sold and Prices

FOREIGN construction materials seem to be accepted with increasing favor by American builders and dealers. The prime advantage these materials have are their prices—in the case of starting materials, very appreciably lower than the domestic market. Finishing materials, on the other hand, usually sell at home product prices. Belgian plate and window glass is an example of the latter, both imported and domestic glass being bought indiscriminately and frequently placed in the same building. It is a matter of glass, not of place or method of manufacture or of price.

Importers of building materials, with few exceptions, sell direct to American dealers, who regularly supply the contracting trade. Some of these dealers handle domestic as well as imported materials. There has been some question as to the attitude of the largest dealers toward imports. A number of recent conferences on the subject have revealed no marked antipathy. In fact, five leading New York firms have expressed willingness to handle foreign materials when these are specified in their customers' orders. They are not prepared, however, to do missionary work for the importers.

Steel warehouse men, on the other hand, view the import situation with less equanimity than do the dealers in masons' materials. The steel dealers have formed an organization known as the Iron and Steel Warehouse Institute, whose purpose is to investigate this whole problem. Although there is some feeling that the American manufacturers are not keenly sensitive to this important problem, it is quite plain that they cannot afford to ignore it. Although steel exports are greater in volume than imports, the favorable balance is only 7.7 per cent, and exports amount only to 2.6 per cent of total mill output.

Eight American ports serve as points of entry: Boston, New York, Philadelphia, Norfolk, Atlanta, New Orleans, Los Angeles and San Francisco. Vancouver is the principal Canadian port receiving European construction materials. It is noteworthy that these materials are coming over as freight and not as ballast. In fact, because of excessive breakage, hollow building tile is not imported at all. Incidentally, American tile manufacturers having access to waterways are in a position to undersell foreign producers. As to tariff, six of the most important materials are on the free list. These are brick, cement, asphalt, lath, shingles and boards. The following carry duties:

Sheet glass, polished, not over 384 sq.in., 4c. per square foot.
Plate glass, cast, polished, unsilvered, not over 384 sq.in., 12½c. per square foot.
Steel, beams, girders, joints, angles, panels, columns, post and other building forms not assembled, ⅛c. per pound.
Steel bars, valued over 1½c. per pound but not over 2½c. per pound, 10.5c. per pound.
Cast-iron pipe, 20 per cent ad valorem.
Hollow tile, 30 per cent ad valorem.

A more intimate understanding of the imported materials situation may be had by examining conditions in and around a specific port. For this purpose the principal port of entry, New York, is here selected. The New York market for Belgian materials is supplied by steamers which dock each week at Erie Basin, Brooklyn. Most of the dealers in the vicinity handle imported masons' materials. Five of the leading New York dealers carrying imported materials are the following:

Steel shapes and reinforcing bars, Steelunion Company, Inc., 17 John St., and Winter Wolff Company, Inc., 225 Broadway.
Cement, the Impex Trading Company, 74 Reade St.
Lumber, lath and plywoods, Robert R. Sizer & Company, 15 William St.
Glass, Semon Bache & Company, 636 Greenwich St.

Imported cement, most of it from Belgium, sells at present for $2.23@$2.24 per barrel, delivered to dealer's docks within lighterage limits, in barge loads of 1,500 bbl. This price includes the cost of four cloth sacks. Domestic cement, alongside docks, New York, to dealers, is $2.33 per barrel, including bag charge and allowing the regular dealer's trade discount of 10c. per barrel. The difference in this case is 9 to 10c. per barrel in favor of the Belgian product. Of the 40,000,000 bbl. of cement consumed in the New York district last year, 500,000 bbl., or 1¼ per cent, came from Belgium.

Imported building brick is selling in the New York market at $16.50@$17 per thousand, delivered to contractor at site of job. As in the case of cement, most of this brick is from Belgium. The price ranges from 50c. to $1 per thousand below the price of Hudson River brick, quoted at $17 to $18 delivered to job in Manhattan. Belgian brick is arriving steadily in New York at the rate of 2,000,000 per week, which is about 7 per cent of the total weekly consumption. Holland face brick, delivered, is $26 to $27 per thousand, compared with a minimum of $29.50 for selected domestic colonials.

Steel shapes of German, French and Belgian manufacture sell at $1.80 per 100 lb., f.o.b. New York. Mill shipments of domestic structurals cost $2.19 per 100 lb., f.o.b. New York. German reinforcing bars are $2.04 per 100 lb., f.o.b. New York dock, against $2.29 for domestic mill shipments.

E. N.-R. Index Numbers

Cost		Volume	
July 1, 1928	**206.65**	**June, 1928**	**308**
June 1, 1928	206.15	May, 1928	299
July 1, 1927	203.68	June, 1927	297
Average, 1927	206.24	Average, 1927	263
Average, 1926	208.03	Average, 1926	228
1913.....	100.00	1913.....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week ended July 17, with some comparisons, total as follows:

(In Thousands of Dollars, 000 Omitted)

Week Ended	Public	Private	Total
July 17, 1928	**$30,063**	**$36,621**	**$66,684**
July 10, 1928	16,757	38,035	54,792
July 19, 1927	16,847	23,895	40,742
Jan. to July 17:			
1928.....	728,962	1,247,312	1,976,274
1927.....	673,317	1,008,048	1,681,365

Some Current Bond Offerings

Buildings	Amount	Interest Rate	Yield
Boston Postal Service Station.....	$650,000	5½	5½
Commercial Exchange Bldg., Los Angeles.....	825,000	6	6
The Fairfax, Pittsburgh.....	2,140,000	6½	6½
Hotel Hildebrecht, Chicago.....	800,000	6	6
Hotel Victoria, New York.....	2,250,000	6	5.47–6
San Diego.....	2,313,000	4–4½	4.25
Wabash-Harrison Bldg., Chicago....	2,100,000	6	6
Public			
Fond du Lac County, Wis.....	200,000	4½	4.15
Foreign			
Rio Grande do Sul (U. S. of Brazil)...	23,000,000	6	6.40–7.53

June Cement Production Ahead of Last Year

Cement production in June, 1928, shows an increase of 1.4 per cent and shipments a decrease of 6.8 per cent, as compared with June, 1927. Stocks at the mills were 19.3 per cent higher than a year ago. Total production for the first half of 1928 amounts to 77,005,000 bbl. compared with 75,058,000 in the same period of 1927, and the total shipments for the first half of 1928 amount to 73,963,000 bbl. compared with 74,775,000 in the same period of 1927.

The statistics are compiled from reports for June from all manufacturing plants except two for which estimates have been made. They include the output of a new plant, located in Tennessee, which began operating during the month.

Chile Plans 275 Miles of Roads This Year

The 275 miles of roads planned for construction in Chile in 1928, according to the Department of Commerce, includes 72 miles of concrete and bituminous concrete, 146 of stone or gravel, 17 of gravel with bituminous surface, and 40 undetermined. It is stated that of the small quantity of graders, tractors and other road equipment now in operation, American machines predominate, and that European competition is of little consequence. A report on the machinery requirements will be made later.